

Roosevelt Wild Life Bulletin

VOLUME I, NUMBER 4

OF

The Roosevelt Wild Life Forest Experiment Station

OF

THE NEW YORK STATE COLLEGE OF FORESTRY

AT

SYRACUSE UNIVERSITY



Published Quarterly by the University, Syracuse, New York

Entered at the Post Office at Syracuse as second-class mail matter



Digitized by the Internet Archive
in 2015

Roosevelt Wild Life Bulletin

VOLUME I, NUMBER 4

OF

The Roosevelt Wild Life Forest Experiment Station

OF

THE NEW YORK STATE COLLEGE OF FORESTRY

AT

SYRACUSE UNIVERSITY



Published Quarterly by the University, Syracuse, New York

Entered at the Post Office at Syracuse as second-class mail matter

ANNOUNCEMENT

The serial publications of the Roosevelt Wild Life Forest Experiment Station consist of the following:

1. Roosevelt Wild Life Bulletin.
2. Roosevelt Wild Life Annals.

The *Bulletin* is intended to include papers of general and popular interest on the various phases of forest wild life, and the *Annals* those of a more technical nature or having a less widespread interest.

These publications are edited in cooperation with the College Committee on Publications.

Exchanges are invited.

CHARLES C. ADAMS

Director and Editor

[388]

Copyright, 1923

by

Roosevelt Wild Life Forest Experiment Station

TRUSTEES OF THE NEW YORK STATE COLLEGE OF FORESTRY

EX OFFICIO

Dr. CHARLES W. FLINT, <i>Chancellor</i>	Syracuse University
Dr. FRANK P. GRAVES, <i>Commissioner of Education</i> ..	Albany, N. Y.
Hon. ALEXANDER MACDONALD, <i>Conservation Comm'er</i> ..	Albany, N. Y.
Hon. GEORGE R. LUNN, <i>Lieutenant-Governor</i>	Schenectady, N. Y.

APPOINTED BY THE GOVERNOR

Hon. ALEXANDER T. BROWN.....	Syracuse, N. Y.
Hon. JOHN R. CLANCY.....	Syracuse, N. Y.
Hon. HAROLD D. CORNWALL.....	Beaver Falls, N. Y.
Hon. GEORGE W. DRISCOLL.....	Syracuse, N. Y.
Hon. C. C. BURNS.....	Watertown, N. Y.
Hon. LOUIS MARSHALL	New York City
Hon. WILLIAM H. KELLEY.....	Syracuse, N. Y.
Hon. EDWARD H. O'HARA.....	Syracuse, N. Y.
Hon. J. HENRY WALTERS.....	New York City

OFFICERS OF THE BOARD

Hon. LOUIS MARSHALL.....	<i>President</i>
Hon. JOHN R. CLANCY.....	<i>Vice-President</i>

HONORARY ADVISORY COUNCIL OF THE ROOSEVELT WILD LIFE STATION

AMERICAN MEMBERS

Mrs. CORINNE ROOSEVELT ROBINSON.....	New York City
Hon. THEODORE ROOSEVELT.....	Washington, D. C.
Mr. KERMIT ROOSEVELT.....	New York City
Dr. GEORGE BIRD GRINNELL.....	New York City
Hon. GIFFORD PINCHOT.....	Harrisburg, Pa.
Mr. CHAUNCEY J. HAMLIN.....	Buffalo, N. Y.
Dr. GEORGE SHIRAS, 3rd.....	Washington, D. C.
Dr. FRANK M. CHAPMAN.....	New York City
Dean HENRY S. GRAVES.....	New Haven, Conn.

EUROPEAN MEMBERS

VISCOUNT GREY.....	Fallodon, England
Sir HARRY H. JOHNSTON.....	Arundel, England

ROOSEVELT STATION STAFF

FRANKLIN MOON, M. F. Dean of the College

CHARLES C. ADAMS, Ph. D., Sc. D. Director of the Station
ALVIN G. WHITNEY, A. B. Assistant Director
WILLIAM CONVERSE KENDALL, A. M., M. D. Ichthyologist
WILFORD A. DENCE, B. S. Assistant

Temporary Appointments*

THOMAS L. HANKINSON, B. S. Ichthyologist**
PERLEY M. SILLOWAY, M. S. Roosevelt Field Ornithologist
HENRY S. PRATT, Ph. D. Roosevelt Field Naturalist
CHARLES E. JOHNSON, Ph. D. Roosevelt Fur Naturalist
ARETAS A. SAUNDERS, Ph. B. Roosevelt Field Ornithologist

Collaborators*

EDWARD R. WARREN, B. S. Roosevelt Game Naturalist
RICHARD A. MUTKOWSKI, Ph. D. Roosevelt Field Naturalist
GILBERT M. SMITH, Ph. D. Roosevelt Field Naturalist
EDMUND HELLER, A. B. Roosevelt Game Naturalist
MILTON P. SKINNER, B. S. Roosevelt Field Ornithologist

* Including only those who have made field investigations and whose reports are now in preparation.

** Resigned as Station Ichthyologist October 1, 1921.

THE RELATION OF FORESTS AND FORESTRY TO HUMAN WELFARE

"Forests are more than trees. They are rather land areas on which are associated various forms of plant and animal life. The forester must deal with all. Wild life is as essentially and legitimately a part of his care as are water, wood and forage. Forest administration should be planned with a view to realizing all possible benefits from the land areas handled. It should take account of their indirect value for recreation and health as well as their value for the production of salable material; and of their value for the production of meat, hides and furs of all kinds as well as for the production of wood and the protection of water supplies.

"Unquestionably the working out of a program of wild life protection which will give due weight to all the interests affected is a delicate task. It is impossible to harmonize the differences between the economic, the aesthetic, the sporting and the commercial viewpoint. Nevertheless, the practical difficulties are not so great as they appear on the surface."

HENRY S. GRAVES,

Former Chief Forester, U. S. Forest Service.

Recreation, Vol. 52, p. 236, 1915.

RESEARCH ON WILD LIFE

"The discovery of new species and races based upon the study of preserved specimens of game animals, has already progressed very far; but the more attractive field which includes the habits of the game remains yet to a great extent unexplored. This field is peculiarly open for investigation to big-game hunters, and to all other men who go far afield and obtain first-hand knowledge of the conditions under which the game animals live. The closest naturalist, with his technical knowledge of the structure of animals, can be trusted to perform the work of classification to a mathematical degree of precision; but we cannot obtain from him a trustworthy account of the behavior of animals in their natural environment, or learn from him the value to the animals of the various structures or characteristics which he has shown them to possess. Much knowledge regarding the habits of game is acquired by the successful sportsman. Yet it is often infinitesimal in quantity compared to what may be acquired if the outdoors observer will direct his investigations along the broad lines covering the life history of the species with which he comes in contact. To carry out such investigations successfully it would be necessary to spend many hours and days, perhaps even weeks and months, observing certain individuals or family groups of game. This is quite beyond the limits of time allotted the average sportsman. Nevertheless much can be learned by the collected evidence from many fragmentary observations providing only these are accurate. A great mass of accurate fragmentary observations will often spell far more progress in investigations of this kind than the observations of a few trained individuals over an extended period of time."

THEODORE ROOSEVELT and EDMUND HELLER.

Life Histories of African Game Animals,

Vol. 1, pp. vii-viii, 1914.

CONTENTS

	PAGE
1. Relation of Summer Birds to the Western Adirondack Forest.....	Perley M. Silloway. 397
2. Notes on the Relation of Birds to Adirondack Forest Vegetation.....	Charles C. Adams. 487
3. The Summer Birds of the Adirondacks in Franklin County, N. Y....	Theodore Roosevelt, Jr., and H. D. Minot. 521 (Reprinted; original date of publication, 1877.)
4. Current Station Notes.....	The Director and Editor. 525

ILLUSTRATIONS

PLATES

Plate 30. BIRDS OF THE ADIRONDACK HARDWOOD FOREST.	
1, 2, Downy Woodpecker (male and female); 3, 4, Hairy Woodpecker (male and female); 5, Wood Pewee; 6, 7, Scarlet Tanager (male and female); 8, Red-eyed Vireo; 9, 10, Black-throated Blue Warbler (male and female). Drawn by Edmund J. Sawyer.....	
	<i>Facing</i> 397
Plate 31. BIRDS OF THE ADIRONDACK BURNED FORESTS.	
1, Flicker; 2, Olive-backed Thrush; 3, White-throated Sparrow; 4, Chestnut-sided Warbler. Drawn by Edmund J. Sawyer..	
	<i>Facing</i> 426
Plate 32. BIRDS OF THE BOG CONIFER FORESTS.	
1, Veery (Thrush); 2, Magnolia Warbler; 3, Lincoln Sparrow; 4, Arctic Three-toed Woodpecker; 5, Myrtle Warbler. Drawn by Edmund J. Sawyer.....	
	<i>Facing</i> 442
Plate 33. BIRDS OF THE VIRGIN ADIRONDACK MIXED FOREST.	
1, Hermit Thrush; 2, Winter Wren; 3, Red-breasted Nuthatch; 4, 5, Golden-crowned Kinglet (male and female). Drawn by Edmund J. Sawyer.....	
	<i>Facing</i> 458

FIGURES

Figure 123. Camp site at Barber Point, Cranberry Lake. The white and yellow birches here are favorite foraging grounds, during July and August, for Crossbills, Goldfinches and Purple Finches.....	405
Figure 124. Part of Habitation Clearing, showing old log building and open area, the site of an abandoned lumber camp, now a center of bird activity.....	405
Figure 125. A part of the Habitation Clearing, showing a dead yellow birch tree, a favorite haunt of Chickadees and Downy Woodpeckers. The fire cherry and aspens in the background harbor many birds, especially the Nashville Warbler.....	406
Figure 126. The Burn, bordering Sucker Brook Inlet. Dense growth of shrubs and burned trees in front; unburned forest in background.....	406
Figure 127. The Burn, bordering a meadow. The charred dead tree trunks are surrounded by a growth of young aspens, willows, low shrubs and meadow grasses. The hole in the stump in center of picture is the site of a House Wren's nest.....	409
Figure 128. Open margin of the Burn, with nesting site of Gold finch in small birch tree. The vegetation includes fireweed, cinnamon fern, scattered fire cherry and clumps of aspen.....	409

- Figure 129. A typical view in the Burn showing the re-occupation of the ground by a thick growth of shrubs and young trees, following a heavy fire of eight years ago. The character of the obstacles encountered in searching for birds' nests is here apparent. . . . 410
- Figure 130. A sunlit space at the edge of the Burn, showing a blueberry shrub in fruit, overhung by aspens and fire cherry. The blueberries are a favorite bird food. . . . 410
- Figure 131. The Burn, back of the Camp, showing dense shrub growth, with intermingled sapling trees. The home of White-throated Sparrows and Chestnut-sided Warblers. . . . 413
- Figure 132. An area of the Burn, with nesting sites of Goldfinch (in birch sapling in middle foreground) and House Wren (in top of dead tree). This association includes fire cherry, maple, birch and aspen saplings. Mature forest in background. . . . 413
- Figure 133. A small stream in the Burn, affording drinking and bathing places for the birds. A favorite haunt of the Chestnut-sided Warbler. . . . 414
- Figure 134. Meadow along Sucker Brook. Note invasion of alders, making conditions particularly favorable to the Song Sparrow and Maryland Yellow-throat. Woodpeckers use the dead standing trees for nesting and foraging places. . . . 414
- Figure 135. Meadow along Sucker Brook, bordering the dense, original forest. The stumps indicate the former character of area cut over. Ruffed Grouse, Hermit Thrushes and Olive-sided Flycatchers inhabit the evergreen forest. . . . 417
- Figure 136. A Bog Conifer Clearing, showing typical bog shrubs, with tamarack saplings and dead tamaracks. Its open character makes this a favorite habitat for birds. . . . 417
- Figure 137. A Bog Conifer area. The bog shrubs are interspersed with white pine on the slight elevations. A few broadleaf trees were left after lumbering. Favorite habitat of the White-throated Sparrow, Lincoln's Sparrow and Myrtle Warbler. . . . 418
- Figure 138. Meadow Bog, at margin of dense conifer forest. Cleared bog forest at left, open meadow at right, and conifer forest in distance, furnishing three distinct habitats. . . . 418
- Figure 139. Rocky shore of Sucker Brook Inlet, at Barber Point, showing character of mixed forest, mostly second growth saplings. Margin of lumbered clearing at left. . . . 421
- Figure 140. View on Sucker Brook, showing tangle of vegetation along its banks. Dead birches at left, with living spruces beyond. A haunt of the Water-Thrush and Solitary Sandpiper. . . . 421
- Figure 141. A pool on lower part of Sucker Brook, formed by encroaching alders and fallen branches. Song Sparrows and White-throated Sparrows are commonly singing in the alder thickets, and the pool is the home of the Water-Thrush. . . . 430
- Figure 142. Sketch map of College of Forestry Summer Camp grounds, at Barber Point, Cranberry Lake, 1915. Adapted from S. N. Riggs. . . . 488
- Figure 143. Sketch map of forest conditions, Barber Point, Cranberry Lake, Wanakena, N. Y. A. Hardwood area. B. Burned area. C. Hardwood forest. Adapted from H. H. Tryon. . . . 489
- Figure 144. Cut-over hardwood forest north of Camp (figure 143, A). Undergrowth largely bird cherry planted by birds. Photo 1915. . . . 491
- Figure 145. Burned area east of Camp (figure 143, B); showing bird cherry, berry bushes and fireweed. Photo 1915. . . . 491
- Figure 146. Cut-over forest of hardwoods, south of Sucker Brook, 1916, (figure 143, C); showing extensive undergrowth of berry bushes. . . . 492
- Figure 147. Virgin forest at Curtis Pond, northeast of Forestry Camp; chiefly of hemlock and spruce. Photo 1915. . . . 492

	PAGE
Figure 148. Colony of quaking aspen, south of Camp on shore of lake (shown in distance) where young trees were much injured by Sapsuckers. Photo 1916.....	497
Figure 149. Sapsucker injury to young aspens.....	497
Figure 150. Sapsucker injury to young aspens.....	498
Figure 151. Colony of aspens and birches at Forestry Camp. The aspens were much injured by Sapsuckers. Photo 1916.....	498
Figure 152. Nearby view of the aspen clump shown in Fig. 151. Photo 1916.....	501
Figure 153. Detailed view of aspen trunks injured by Sapsuckers.....	501
Figure 154. Sapsucker working on aspens. Photo 1916.....	502
Figure 155. Injury to large-toothed aspen by Sapsucker, at Forestry Camp.	502
Figure 156. A yellow birch south of the Camp, injured by Sapsuckers. Photo 1915.....	504
Figure 157. Detailed view of part of yellow birch trunk shown in Fig. 156. Photo by J. Fred Baker.....	504
Figure 158. Large yellow birch south of Forestry Camp. This tree had been killed by Sapsuckers. Photo 1915.....	505
Figure 159. Section of trunk of yellow birch shown in Fig. 158. Photo by J. Fred Baker.....	505
Figure 160. Paper birch injured by Sapsuckers and showing swelling of trunk.....	507
Figure 161. A section of the paper birch trunk shown in Fig. 160.....	507
Figure 162. Hemlock trunks, with numerous borings by Sapsuckers, from hardwood forest near Forestry Camp. Photo by J. Fred Baker.....	508
Figure 163. Beech injured by Sapsuckers, in cut-over forest south of Forestry Camp. Photo 1915.....	508

RELATION OF BIRDS TO FORESTS

"The total damage to trees by insect pests is enormous, and several years ago was estimated to exceed \$110,000,000 annually. Not only is the damage extremely large, but the difficulties of directly combating insect pests in forests are so great that man is able to do comparatively little. The services of natural enemies of the destructive insects should therefore be highly appreciated. If they serve to reduce the damage by only a small percentage, the gain to the country is a very large sum. Among these enemies, birds are conspicuous. Their services are well known and have long been acknowledged. No reasons have thus far developed for considering any other group of the natural enemies of forest insects in general, more important than birds."

W. L. McATEE,

American Forestry,

Vol. 21, pp. 681-682; 1915.

"Birds are not only essential to the welfare of the tree, but the tree is necessary to the life of the bird. Consequently, there has been established what is termed 'a balance of life' wherein there is the most delicate adjustment between the tree, the insect, the bird and the sum total of the conditions which go to make up their environment. * * * Birds are of value to the forest, however, not only as the destroyers of their insect foes, but the birds with the squirrels, help plant the forest by distributing seeds. The seeds which are encased in a pulpy covering, those of the berry or fruit-bearing trees, are voided unharmed by the birds often at a point far distant from the parent tree, the bird thus acting as their distributor. Acorns, beech-nuts, and chestnuts are frequently dropped or hidden by birds, and the seeds of pines are released and scattered by the birds that seek them in their cones. In short, we believe it can be clearly demonstrated that if we should lose our birds we should also lose our forests."

FRANK M. CHAPMAN,

*Seventh Report, N. Y. Forest, Fish and Game
Commission, pp. 117, 120; 1901*



PLATE 30. BIRDS OF THE ADIRONDACK HARDWOOD FOREST

1, 2, Downy Woodpecker
(male and female).

3, 4, Hairy Woodpecker
(male and female).

5, Wood Pewee.

6, 7, Scarlet Tanager
(male and female).

8, Red-eyed Vireo.

9, 10, Black-throated Blue Warbler
(male and female).

Drawn by Edmund J. Sawyer

RELATION OF SUMMER BIRDS TO THE WESTERN ADIRONDACK FOREST

By PERLEY M. SILLOWAY

CONTENTS

1. Introduction.
2. The Western Adirondack Forest Environment.
3. Habitat Preferences of Forest Birds near Cranberry Lake.
4. Influence of Certain Forest Trees on Bird Life.
5. Enemies of Adirondack Birds.
6. A Census of the Birds at Cranberry Lake.
7. A List, with Notes, of the Summer Birds about Cranberry Lake.
8. List of References.
9. Index.

INTRODUCTION

The general purpose of the studies chronicled in these pages was to examine the interrelations between birds and the forest, that is, how the one influences the other, along the western border of the Adirondack Mountains. The scene of the investigation was at the permanent summer camp of the State College of Forestry at Barber Point on the south shore of Cranberry Lake, where the author spent the midsummer weeks in 1916. Two general aims were thus combined,—to gain a knowledge of the character of the local summer bird life, and to make a survey of its environment. The neighborhood of Barber Point was scanned carefully to distinguish local factors, or “minor habitats,” and the birds of each minor habitat were studied as a definite group of tenants, technically styled “avian association;” and both the number of species and the number of pairs breeding in each minor habitat, the sum of which measured the bird population of the district covered, were counted as closely as possible. A census properly made shows the standing of a district, in its ability to support birds, as compared with other districts, and is a basis for judging the value of the environment in any given case. Great difficulties were met with at this wilderness station in daily attempts to make a census; but I regard the result as fairly indicative of the quantity of bird life there, and also of the ecological preferences—that is, preferences as to surroundings—of the species in each association.

The general aspects of the forest in the western Adirondacks, where it is a uniform mixture of conifers and hardwood trees, with close undergrowth, are here first described in their relation to summer birds; and examples are given of how the minor habitats mentioned above naturally evolve, with the reasons why it is well to study

the subject by means of them. These limited, distinct features of the forest are ten in number; and each one, differing in some definable characteristic from the others, is taken up in order and described ecologically.

The general situation having thus been explained, attention is turned to the contributions made by the various trees, bushes, and vines of the region to the bird economy, with special reference to the food supplied by them. This chapter is especially to be noted as an attempt to make clear the wealth of subsistence furnished to birds by this forest, and the way it is utilized.

Following this part of the paper there is a general annotated list of the birds of the Cranberry Lake district, most of which were observed by the author during his stay at Barber Point. It is intended to enable not only students but interested visitors to become acquainted with the local bird fauna, by showing them where the various kinds may be looked for, and what are their songs, mating habits, and other peculiarities. Brief mention of the characteristic marks by which the different species may be identified will aid amateurs to recognize them.

I desire to express my sincere appreciation of the kindness extended to me by Dr. Charles C. Adams and former Dean Hugh P. Baker of the New York State College of Forestry, in their hearty cooperation with my ideas and methods of observation. To the Hon. R. M. Barnes, of Lacon, Illinois, special acknowledgment is due for his liberality in giving the assistance that rendered these studies possible. I wish to mention also my obligations to Prof. R. P. Prichard, Director of the Forestry Summer Camp in 1916, for his uniform courtesy in placing the camp facilities at my disposal, and to Mr. W. E. Sanderson, in charge of the camp commissariat; also to Dr. W. L. Bray, Dr. M. W. Blackman, Dr. L. H. Pennington, Prof. H. B. Waha, and Mr. Arthur S. Rhoads, for their courtesies in questions of identification of trees and plants and for other assistance. All of these have united to make my experience with them a season of profitable work and a pleasant memory. Finally I desire to acknowledge the assistance of Mr. Ernest Ingersoll and Professor Alvin G. Whitney in the final revising of the manuscript.

The authority used for the scientific names of the birds mentioned in this paper is the "A. O. U. Check-List of North American Birds," 1910, with revisions to date; and for the plants "Gray's New Manual of Botany," 1908. The brief descriptions of bird species in the annotated list are based chiefly on Hoffmann's "Guide to the Birds of New England and Eastern New York," 1904.

THE WESTERN ADIRONDACK FOREST ENVIRONMENT

Cranberry Lake is situated in the southeastern corner of St. Lawrence County, New York, among the western foothills of the Adirondack Mountains. It may be reached at the neighboring town of Wanakena by railway from Watertown, and also from the east by the New York Central Railroad to Childwold, and thence

by the Grasse River Railroad to Cranberry Lake village at its northern extremity. Service boats transport visitors to the various landings on its shores.

The Cranberry Lake district is typical of the western Adirondack region. The lake is surrounded by a forest that has been modified as elsewhere by lumbering operations and by fires; and it presents much variety, from patches of dense virgin timber to denuded hill-sides showing only bare rock slopes and exposed sand hills, while many burned areas blacken its shores. The lake has an elevation of 1,486 feet above sea level, and as the highest mountains in the vicinity are only slightly more than 2,300 feet in altitude, the forest there has that same uniformity of composition that characterizes the whole Adirondack region, except on the highest peaks.

This forest, the great "North Woods," is characteristically a mixed forest of conifers and hardwoods; and as it has reached its ultimate stage of adjustment, as to both the mutual relations of the trees and plants composing it and as to the physical environment, it is said to have attained its "climax." Although it has been greatly injured by the axe and by fire, its primitive character is still apparent.

It needs no argument to justify the conclusion that the nature and extent of these woodlands have determined the character and limitations of their avifauna, taking into consideration the general climate of the region. Safety in rearing their young, a minimum of danger from molestation by enemies, and retreats for protection and retirement, are requirements that render woodlands a vital necessity for the great majority of birds during the nesting season. Yet the situations most suitable are not in the vast stretches of forest solitude, but rather in broken woodlands where there are areas of illumination, streams or ponds, shrubbery for shelter and nesting places, and an ample food supply. With these advantages the Adirondack region is abundantly supplied, as well as with a variety of conditions sufficient to satisfy a wide range of bird habits and tastes.

The Adirondack mixed forest is composed of a few species of conifers and hardwoods, the two groups being represented in about equal proportions. The conifers are the balsam fir (*Abies balsamea*), red spruce (*Picea rubra*), black spruce (*Picea mariana*), white pine (*Pinus Strobus*),—also red pine (*Pinus resinosa*) on Cranberry Lake,—hemlock (*Tsuga canadensis*), and larch or tamarack (*Larix laricina*). The larch grows principally in boggy forests, but white cedar (*Thuja occidentalis*) is to be found where swamps prevail. The hemlock is associated chiefly with streamsides and lakeshores, or cool north slopes, where there is plenty of moisture combined with good drainage. The white pine abounds on sandy soils. The balsam and spruces are very generally distributed. The hardwoods include the sugar maple (*Acer saccharum*), beech (*Fagus americana*), paper or white birch (*Betula alba papyrifera*), and yellow birch (*Betula lutea*). There are no other prominent deciduous trees, although frequently the large-toothed aspen (*Popu-*

lus grandidentata) attains fair proportions along rocky lakeshores with the American aspen (*Populus tremuloides*), of slightly smaller size. Associated with the trees there is much undergrowth consisting of witch hobble (*Viburnum alnifolium*), cinnamon fern (*Osmunda cinnamomea*), seedlings and saplings of the parent trees in various stages of growth, and other elements.

Many stream valleys intersect the outer rim of the Adirondack plateau and converge like spokes of a wheel toward the "hub" of the region. These stream valleys form highways up which the more abundant and varied vegetation of the lower levels makes an ascent along the watercourses, thus creating lines of valley woodland reaching far into the forest characteristic of the high ridges and the central plateau. The invasion of this lowland vegetation inclines lowland birds which are fond of it and more or less dependent on it, to ascend the hills and mingle with the species that prefer the elevated evergreen woods. Thus the animal life of the region is as mixed as the forest, and any attempt to define zoological "zones" or take account of any influences of altitude (short of the high "alpine" peaks) is of little value. Whatever degrees of so-called Canadian character the fauna presents at 3,500 feet elevation, it also exhibits at 1,500 feet; and whatever degree of similarity to the Alleghanian fauna it shows at 1,500 feet elevation is also evident at 3,500 feet. These facts are amply demonstrated by comparing the list of birds resident in summer at Cranberry Lake with a list of those of the Mount Marcy region.

It is natural to ask why the 101 species of birds to be enumerated in Chapter 7 choose this region for their annual seasonal home. What are the local features that determine their preference? The desirability of the region appears to be found in the character of the widespread forest and its lesser vegetation, enhanced by the presence of a plentiful water supply in lake and streams, and the sunlit openings provided by swamps, bogs, burned areas and clearings. The summer temperature is favorable, the average temperature of a nesting site more or less exposed to the sun being about 85°F., while that in low bushes or on the ground, where nearly all birds build their homes, is only about 65°F.

The western Adirondack border in particular furnishes an adequate supply of food, both animal and vegetable, in the form of a vast variety of insects, seeds, berries, and other fruit. The virgin forest offers a less plentiful and varied bill of fare than the lowlands; but the effects of widespread lumbering operations in the region have been to create "burns" and clearings, where fruit-producing bushes and trees have grown in profusion, thus gradually extending the food supply attractive to the birds. Frequent openings in the heavy woods are therefore desirable, to give spots of illumination where shrubbery can thrive and bear its fruit. Summer camps and inns might be made more attractive, from the bird lover's viewpoint, by having near them a clearing for the natural growth of berry-producing shrubbery attractive to birds other than those of the surrounding virgin woods.

Another favorable circumstance is the scarcity of natural enemies, — animals that prove a terror to small birds in the nesting season, either by destroying the eggs and young in the nest or by destruction of the young while helpless soon after leaving the nest. Such enemies are now scarce in the Adirondack woods. Squirrels are not very abundant, the lumbering of conifers having tended to restrict their food. Harmful birds of prey, such as the Great Horned Owl, the Goshawk, Cooper's Hawk, and the Sharp-shinned Hawk, are comparatively scarce. Moreover, there is a dearth of other birds that molest smaller and weaker ones, such as the Bronzed Grackle, Cowbird, the Crow, Raven, Canada and Blue Jays and the Shrike. There is also an absence of snakes, such as the black-snake and the rattlesnake, the former of which especially is a dreaded enemy of birds nesting on the ground or in low bushes. The mammals that prey on nesting birds, but apparently are not common in the region, include the weasel, skunk, mink and marten. More numerous, however, are the white-footed mouse, chipmunk, red squirrel, and especially the raccoon.

HABITAT PREFERENCES OF FOREST BIRDS NEAR CRANBERRY LAKE

The Summer Camp of the State College of Forestry in 1916, as now, was located at Barber Point, near the mouth of Sucker Brook, on the southern shore of Cranberry Lake, New York. No public road reaches the locality, for it has no regular inhabitants; but it has been cut over for lumber and half-obliterated wood roads lead inland in various directions. The camp site is a level space of perhaps four acres, about twenty feet above the ordinary level of the lake, with a sandy soil, and extending back to the foot of a rocky ridge. The "campus" is clear of bushes, but a few large maples, beeches and birches have been left standing, and some white pines and aspens grow along the brink of the lake; while the eastern border is shielded by a fringe of mature trees and berry-bearing shrubs.

As my special purpose was to investigate the relations between the forest and its birds, and as I knew that certain birds belonged to one sort of place or set of conditions, and others to another, some preferring marshy spots, others uplands, some confining themselves to dense woodland and others to open sunny spaces, I thought it would be useful to discover what varieties of situation existed in this neighborhood; and having found them to study each in detail as to the conditions that seemed to attract their characteristic birds. After an examination of the neighborhood, I considered the following list of habitats worth separate treatment, as each seemed to present some peculiar attraction for certain birds and to exert particular influences upon them,—the birds in turn reacting on and tending to modify their forest surroundings. My field notes were therefore

separated so as to illustrate the ten different situations or "minor habitats," distinguished by local names, as follows:

- | | |
|------------------------|---------------------------|
| 1. Open Camp Site | 6. Bog, Open and Forested |
| 2. Partial Clearing | 7. Virgin Forest |
| 3. Habitation Clearing | 8. Lumbered Clearing |
| 4. Burned Tract | 9. Open Hardwood Forest |
| 5. Dry Grass Meadow | 10. Sucker Brook |

These will be considered in the above order.

1. The Open Camp Site. All the woodland birds may be seen or heard from the Camp, for their activities bring them in and out of the trees on the campus or surrounding it (figure 123), while the Bald Eagle and various waterfowl and shore birds, either residents or visitors to the lake, including the Great Blue Heron, Herring Gull, Loon and others, were added to the list from day to day. Kingfishers and Bank Swallows nested in burrows in the sandbanks along the shore. During the season of 1916 one or more pairs of Song Sparrows, Slate-colored Juncos, Cedar Waxwings, Red-eyed Vireos and Chipping Sparrows nested within the area of the Camp.

2. The Partial Clearing. Immediately back of the open camp space, occupying about the same area and of a similar character, is a fringe of open timber, undergrown with shrubbery, covering a rocky knollside. In early lumbering operations the conifers were removed, leaving tall maples, beeches and birches, among which are scattered a second growth of hardwoods and a few of the original conifers. The open places, littered with stumps, fallen trunks and debris, have been liberally overgrown with saplings and berry bushes, so that they virtually occupy all the illuminated space. The ridge makes a gradual ascent to the rim rock back of the Camp, attaining an elevation of about 330 feet at a distance of 600 feet from the edge of the campus. This clearing is the home of the birds that visit the campus, and it constitutes a distinct habitat in itself. It contains a running spring, from which water trickles under the bushes in a way to provide favorable bathing places; and in the course of the day most of the birds of the neighborhood may be observed at or near this spring, either feeding in the surrounding coverts or moving about in the trees scattered over the area. The following species are identified with this partial clearing as a nesting habitat: Bluebird, Robin, Chickadee, White-breasted Nuthatch, Brown Creeper, Catbird, Redstart, Maryland Yellow-throat, the Mourning, Chestnut-sided and Black-throated Blue Warblers, Red-eyed Vireo, Cedar Waxwing, Rose-breasted Grosbeak, Song Sparrow, Chipping Sparrow, Least and Alder Flycatchers, Wood Pewee, Yellow-bellied Sapsucker and Downy Woodpecker. The partial clearing thus affords an excellent illustration of the influences exerted by tall trees scattered over a clearing, in connection with suitable shrubbery as a covert, water facilities for bathing and drinking, a

nearby food supply, and open illuminated spaces to create a most desirable summer habitat for birds.

The most striking thing which such a clearing suggests is the influence of tall trees in an otherwise open area. The tops of such trees naturally receive the earliest illumination and warmth in the morning, and the latest at close of day; hence the most active songsters at dawn seek stations in trees to feed and sing, and from these sites they also chant in the lingering evening light (see Mousley, '19, '21). By visiting the tree-tops in the early morning, before the shrubbery and lower growth of the ravines and ground cover receive their first direct rays, the birds add materially to their hours for foraging and singing. It is supposable that day-flying insects are active as a rule in the tree-tops before those in the cooler and unlighted foliage below are stirring. The first spring warblings of the Bluebird are heard from the tops of tall trees. Robins recite their morning and evening choruses from commanding sites, and the evening songs of other Thrushes generally float down from the higher branches. The song of the Ruby-crowned Kinglet is a feature of the tall conifers, a burst of tuneful melody from illuminated spots in the woodland. The Red-breasted Nuthatch prefers to glean in the higher foliage. Many of the Warblers spend their time in the upper portions of the forest canopy, searching for their daily fare and uttering their short songs as they flit among the twigs in their quest. The Red-eyed Vireo loves the leafy screen of the taller hardwoods for singing and feeding. The Scarlet Tanager prefers the sunlight and warmth of the tree-tops, and the Rose-breasted Grosbeak seeks the highest stations for its full-voiced vernal song. The Pine Siskin and the Red Crossbill pursue their nervous activities in the tops of the dominant trees. The Crested Flycatcher usually finds a cavity in the upper story of the woods for its nesting site, as also do such woodpeckers as nest in the wilderness. Most of the rapacious birds build their nests in the tops of trees from which they can command a view of the neighborhood. Towering trees produce certain effects by their projection of dense shadows. On the middle story of the forest canopy and upon the ground cover their shadows lay a denser shade, augmenting the gloom that produces a twilight effect in the forest even at noonday,—a feature of the original woods that all birds avoid in favor of the sunny places. In the tops of trees, reaching upward to uninterrupted light, birds may be heard calling or singing as they seek their insect fare amid the burnished foliage, while below all seems silent and forsaken.

The effect of masses of light, as contrasted with prevailing shadow, is noticeable on the eastern shores of streams early in the morning, and on their western banks in the afternoon. When the sun is in the west, gloom envelops the wooded western banks of brooks and ponds, while their eastern margins still gleam in the flooding sunlight. Thus on opposite banks of even narrow streams diverse lighting affects the activities of the birds along their courses, much as do the sunny tops and shaded depths of a level forest. On the

other hand, the shadows of the taller trees may be grateful and advantageous to birds when cast over their coverts during the heated hours, producing cool retreats. Certainly a region lacking shaded coverts would not be tolerable for many of our summer birds, since it is customary for them to retire in the middle of the day into the cool shrubbery for a siesta. Few birds are heard in the hot noon hours, and fewer are seen. The woods are then silent and appear deserted, and it is an unpromising time to observe their winged inhabitants, whose slight movements are then limited to the low, shaded places. In an ordinary day in midsummer at Cranberry Lake, when a thermometer exposed to the sun registers 85° F., the mercury will fall to 65° when placed in shaded shrubbery. It is thus plain that the taller trees bring about circumstances that cause a series of adjustments in the daily life of the birds within their influence, leading them to regulate their movements so as to obtain favorable degrees of protection, light, temperature and subsistence. Whatever may be the value of light and shade as factors produced by tall trees in a habitat, any serious disturbance of the equilibrium resulting from their daily alternation must necessarily result in new adjustments of the birds to the changed conditions.

3. The Habitation Clearing. This term is used to designate an area of original woods from which the trees have been cleared by man to provide a site for buildings, a garden, sawmill or lumber camp. A clearing in this region is usually insignificant in extent compared with the surroundings, hence it is a secondary factor introduced by man into an avian habitat otherwise uniform. Any clearing, therefore, is an influence in the forest tending to restrict the dominance of certain birds and to enlarge the range of others. A habitation clearing, however, differs from an opening made by felling and removing the timber in that it projects into the locality certain influences, offering attractions and inducements that do not always follow the mere removal of trees. Buildings for the use of man and his domestic animals, with their accompaniments, serve as an influence to repel certain birds and to attract others. In addition, there are introduced into the clearing a number of foreign weeds and grasses, such as clover, timothy, blue grass, mustard and other seed-producing plants much patronized by birds as food, making the vegetation so different from the original woods that it constitutes a special habitat in itself.

Back of the Summer Camp a short distance, in an easterly direction, is the site of an abandoned lumber camp (figure 124). Ruins of log houses stand near the brook, and old trails lead thither. It contains no tall trees, so that its whole area is in full illumination; it has, however, several tall dead snags and holes, more or less fire-scarred (figure 125). Along the trails, and in open places where bushes have not established themselves, timothy, blue grass, clovers and other pasture grasses abound, with many of the weeds that thrive under cultivation. Interspersed everywhere in this clearing are elements of the aspen-fire cherry-birch association, with blackberry,



Fig. 123. Camp site at Barber Point, Cranberry Lake. The white and yellow birches here are favorite foraging grounds, during July and August, for Crossbills, Goldfinches and Purple Finches.



Fig. 124. Part of Habitation Clearing, showing abandoned log building and open area, the site of an old lumber camp, now a center of bird activity.



Fig. 125. A part of the Habitation Clearing, showing a dead yellow birch tree, a favorite haunt of Chickadees and Downy Woodpeckers. The fire cherry and aspens in the background harbor many birds, especially the Nashville Warbler.



Fig. 126. The Burn, bordering Sucker Brook Inlet. Dense growth of shrubs and burned trees in front; unburned forest in background.

raspberry and other fruit-bearing shrubs of the region. Here the dearth of tall trees has restricted the number of species of birds, the absence of the Robin and some other familiar species being especially noticeable. The following species were found nesting here: Olive-backed Thrush, House Wren, Catbird, Redstart, Yellow-throat, Chestnut-sided and Nashville Warblers, Red-eyed Vireo, Cedar Waxwing, Rose-breasted Grosbeak, Song and White-throated Sparrows, Goldfinch, Least Flycatcher and Flicker. This clearing was freely visited by most of the birds of the neighborhood at various times in the season, for in midsummer it abounds with wild fruits; and it is likely that it was the most popular bird resort of all.

The general influence of clearings in a forested region on the local summer birds is well worth inquiry, as it produces a new order of ecological conditions. "By the ecological distribution of birds," says Dr. Charles C. Adams ('08, pp. 110, 122) "is meant that correlation between environmental conditions and the occurrence and association of certain species of birds. . . . Every field naturalist has observed the general correlation of certain birds with certain kinds of vegetation." He defines (l. c., p. 128) bird succession as "a change from the dominance of certain species or associations to that of others." Cary ('11, p. 34) shows that deforestation in high mountains in Colorado results in warmer local conditions, and consequently in an upward extension of the plant growth from below. Sunlight overspreads the ground, and the open spaces begin to present new forms of vegetation serviceable as cover and forage for insectivorous and fruit-eating birds. The occurrence of a greater variety of bird life in a clearing than in virgin forest is wholly in accordance with a fundamental law of ecological succession as given by Adams ('08, p. 125): "Where dominance obtains, avian variety is limited so that the greatest diversity occurs where local influences prevail, and at the margins of the formation." A clearing projects into the area of dominance a "margin," or a progressive series of "margins," productive of greater diversity than could be the case while the original forest held sway over the area. By this same law we account for the great variety of bird life in the Barber Point neighborhood, since it presents many local features of open campus, partial clearing, habitation clearing, burned tract, lumbered clearing, bog forest, meadow and dense forest, besides secondary factors of lakeshore and brookside. Each minor habitat or secondary factor creates a "margin" in the original forest, inducing the fullest diversity of species.

In the western Adirondack region, the clearings, where the soil is unaffected by fire, become quickly covered with berry-producing shrubs, including elderberry, blackberry, raspberry, blueberry and others, and the birds are more and more attracted to clearings as these fruits spread. Among the newcomers are Warblers, Sparrows and others that require a bushy covert. Furthermore, the shrubbery is prolific in insect food, and hence an additional influence is exerted upon the insectivorous birds to attract and hold them as tenants of the clearing.

Birds are inclined to maintain established spaces through which they can roam in singing and feeding without interference from others of their own kind. (See Mousley, '21, and Saunders, '14). When it is recalled that several broods of birds are reared in a small, definite habitat, it is a logical question to ask: Where are they to dispose themselves the next season, if all survive and the parents return to their former habitat? The new clearing partly solves the problem by affording increased space for birds nesting in the open; and this fact suggests an explanation of the phenomenon of the fairly constant numbers of individuals and species in any particular place. Many examples might be cited to show that birds adapted to their conditions immediately resort to new clearings. Orchards, especially those infested with canker worms or other insects, become a general rendezvous for the birds of the neighborhood. "Birds of the most varied character and habits," says Dr. S. A. Forbes ('82, p. 20), speaking of a certain orchard, "migrant and resident, of all sizes, from the tiny Wren to the Blue Jay, birds of the forest, garden and meadow, those of arboreal and those of terrestrial habit, were certainly either attracted or detained here by the bountiful supply of insect food, and were feeding freely upon the species most abundant." Many cases of this kind indicate that the prevalence of desirable insects, easy to be obtained, is a powerful influence in attracting birds, and that birds are led on this account to seek out clearings and natural openings in a forested region in order to take advantage of the abundance of suitable food.

4. The Burned Tract. I define as the "Burn" (figure 126) an area on the lakeshore east of the Camp, about half a mile in width, that was swept by fire in 1908. On its eastern side it merges into a bog partially forested, and along its southern side there is a dry meadow (figure 127). This burned tract is the center of the bird activities of the Barber Point neighborhood, for it presents features which are probably the chief factors in making that neighborhood a major avian habitat. Its aspect after eight years of new growth is that of the aspen-fire cherry-birch association (figure 128). It has no large living trees except in one small spot near its middle, where there is a group of tall hardwoods as relics of the original. Everywhere over the Burn are tall dead snags, boles and stumps, the remains of hardwoods evidently left by the lumbermen when the conifers were taken out. Later these trees were killed by the fires, and some of the trunks still remain standing, while the rest have fallen in a general tangle, difficult to travel through (figure 129). The drier parts of the burned land and its marginal aspect are well indicated in figure 130. F. M. Gaige ('14, p. 74) has explained the effects of such a burning on the local distribution of birds in northern Michigan. "It excluded," he tells us, "some species that must otherwise have been present, and favored the introduction of others by influencing food, nesting sites and enemies, and it affected the birds both in their breeding and migration seasons. Very interesting are the species favored by the Burn. They



Fig. 127. The Burn, bordering a meadow. The charred dead tree trunks are surrounded by a growth of young aspens, willows, low shrubs and meadow grasses. The hole in the stump in center of picture is the site of a House Wren's nest.



Fig. 128. Open margin of the Burn, with nesting site of Goldfinch in small birch tree. The vegetation includes fireweed, cinnamon fern, scattered fire cherry and clumps of aspen.



Fig. 129. A typical view in the Burn showing the re-occupation of the ground by a thick growth of shrubs and young trees, following a heavy fire of eight years ago. The character of the obstacles encountered in searching for birds' nests is here apparent.



Fig. 130. A sunlit space at the edge of the Burn, showing a blueberry shrub in fruit, overhung by aspens and fire cherry. The blueberries are a favorite bird food.

fall directly into two classes, those furnished with suitable breeding conditions and those supplied with well provisioned halting places during migration." Among the species that found breeding places favored by the Burn, he mentions Woodpeckers, the Tree Swallow, Chimney Swift and Bluebird. Of the other breeding birds he says (l. c., p. 77): "To them the fire provided a long, new area of open land, much of which has since been covered to a greater or less degree with weeds and grasses. This permitted the birds to enter a region previously excluded from their range."

In its present aspect the Burn is dominated by aspens, fire cherry, birches, maples and willows, all in shrub or sapling stage and scattered in clumps over the area, with blackberry, raspberry, blueberry and tree seedlings forming a tangle wherever there are open spaces, and furnishing fruit and insect food in abundance (figures 131 and 132). As a further asset of this particular burn, there is plenty of water, as small rills trickle under humus-covered logs and rocks, forming shaded drinking and bathing places (figure 133). Among the birds frequenting the Burn, for nesting or foraging, are the Bluebird, Robin, Olive-backed Thrush, Chickadee, White-breasted Nuthatch, Winter Wren, House Wren, Catbird, Redstart, Canada Warbler, Maryland Yellow-throat, the Mourning, Chestnut-sided and Nashville Warblers, Cedar Waxwing, Scarlet Tanager, Rose-breasted Grosbeak, Song and White-throated Sparrows, Goldfinch, Purple Finch, Blue Jay, the Least, Olive-sided and Crested Flycatchers, Kingbird, Ruby-throated Hummingbird, Flicker, Sapsucker, Downy and Hairy Woodpeckers, Broad-winged Hawk and Canada Ruffed Grouse. Overhead, Chimney Swifts, Bank Swallows and Tree Swallows pursue their insect prey. Some of the typical birds of the Burn are illustrated in plate 31.

5. The Dry Grass Meadow. Sucker Brook, coming in from the east, constitutes an important secondary influence upon the bird life about Barber Point. About a half-mile up the brook is a level, dry meadow lying between the Burn and the brook, forming a special bird habitat about half a mile long and about ten rods wide (figure 134). Stumps here and there mark the site where timber had been removed in lumbering days (figure 135), and charred logs tell the usual tale of fire following the logging season. After the fire in 1908, owing to soil and moisture conditions, this tract became an open meadow. In 1915, to save the remainder of the neighborhood from threatened fire, this meadow was backfired, hence its aspect in 1916 represents but one season's growth. It is covered as a whole with coarse grass growing waist high, chiefly *Calamagrostis*, interspersed with which are berry bushes, occasional clumps of blue flag (*Iris versicolor*), and groups of speckled alder (*Alnus incana*), willows, aspens and others encroaching from the contiguous Burn. It thus appears that this meadow is passing into the shrub stage, the result of seeding in from the alder-birch-aspen association on one side, and from the alders along the brook on the other. Additional evidence of reforestation is seen in the young conifers spreading into the open area. Here and there stand

tall stumps and boles serviceable to many birds as perching and nesting places. The characteristic tenants of this meadow division were the Song Sparrow and Maryland Yellow-throat, they being the only residents truly associated with the grass cover. In the low shrubs and alders at the edges the Rusty Blackbird was sparingly represented. Cedar Waxwings nested in the sapling clumps, Chipping Sparrows utilized the shrubbery, and the House Wrens used convenient cavities made by Woodpeckers and Nuthatches in the dead stubs. No grass-inhabiting sparrows or upland meadow birds were seen there, and no Sparrow Hawk or Marsh Hawk; but other observers by keeping on the lookout may supply this unexpected deficiency in the list. It is interesting to note that this meadow, small as it is as a special habitat, serves to distinguish the preferences of the Red-winged Blackbird from those of the Rusty Blackbird; the former is found regularly on several floating bog islands off the lakeshore in the neighborhood, but not in this meadow, while the Rusty Blackbird is restricted to the meadow alone.

6. The Bog, Open and Forested. Immediately east of the Burn there is a remnant of forest constituting a bog. It was lumbered at an early day, and there are still standing several deformed specimens of the original conifers. The distinct character of this bog area, however, is indicated by the larch or tamarack (figure 136), not now found elsewhere in the Barber Point neighborhood except as an occasional sapling in some moist kettle-hole or depression. A few veteran stems of this species tower from the Bog, and there is a fair representation of saplings apparently fifteen or twenty years old. This Bog is formed by the drainage from one side of the Burn, and hence it sustains a typical sphagnum growth, with which are associated immature conifers left partially undisturbed by lumbering, and an occasional white pine (figure 137). There are the typical low shrubs, such as sheep laurel (*Kalmia angustifolia*), viburnum, service berry (*Amelanchier*), leather leaf, mountain holly, blueberry, red maple seedlings, snow-berry and dogwood; also the cinnamon fern and deer-hair sedge. Interspersed throughout the Bog are young white pines, balsam fir, red and black spruces, and tamaracks, with remnants of the former hardwoods. Sphagnum moss grows in a thick mass over the ground, covering holes between projecting roots and alongside boulders, covering fallen logs, and thriving above the sub-surface water holes. This Bog makes an abrupt transition from the Burn, constituting a minor habitat essentially different from any yet described, both in its bog characteristics and in its prevailing coniferous complexion. Also, a part of it is really open, supporting only low shrubs and young second growth; and it is fringed by a strip of virgin forest, to which it presents an abrupt contrast. In fact, the Bog lies between the Burn and Virgin Forest in such a way that there are presented three distinct minor habitats of interesting character, affording a good opportunity for direct comparison (figure 138).

Among the nesting birds of the Bog are the Veery, Brown Creeper, the Canada, Black-throated Green, Black-poll, Myrtle and



Fig. 131. The Burn, back of the Camp, showing dense shrub growth, with intermingled sapling trees. The home of White-throated Sparrows and Chestnut-sided Warblers.



Fig. 132. An area of the Burn, with nesting sites of Goldfinch (in birch sapling in middle foreground) and House Wren (in top of dead tree). This association includes fire cherry, maple, birch and aspen saplings. Mature forest in background.



Fig. 133. A small stream in the Burn, affording drinking and bathing places for the birds. A favorite haunt of the Chestnut-sided Warbler.



Fig. 134. Meadow along Sucker Brook. Note invasion of alders, making conditions particularly favorable to the Song Sparrow and Maryland Yellow-throat. Woodpeckers use the dead standing trees for nesting and foraging places.

Magnolia Warblers, Blue-headed Vireo, Cedar Waxwing, Lincoln's and White-throated Sparrows, Purple Finch, Blue Jay, the Alder, Yellow-bellied and Olive-sided Flycatchers, and the Arctic Three-toed, Downy and Hairy Woodpeckers (plate 32).

7. The Virgin Forest. Continuing eastward from the Camp up Sucker Brook, we reach a beginning of the heavy forest, which extends for several miles onward and includes the neighborhood of Curtis Pond, Irish Pond and Dog Pond, making an area of woodland as nearly original in its character as can be found in the western Adirondack region. This large timber begins about a mile from Camp and affords opportunity for comparisons of three secondary influences in the preferences of the birds for summer habitats,—namely, the Bog, the Meadow, and the Virgin Forest. The trees are conifers and hardwoods in about equal proportion, the former perhaps predominating. There are no bushes, the ground being shaded and generally overgrown with *Sphagnum* and wood sorrel (*Oxalis*), with a thin growth of seedlings from the parent trees. Within, it is dark, damp and silent. The birds to be seen in this dense forest are few. There is a minimum of light, and hence birds fond of sunshine are repelled. Other species avoid the dark forest because their mode of life associates them with scattered shrubbery or thickets. Here, however, the Hermit Thrush is to be seen at its best; the Golden-crowned Kinglet works in the middle story of the foliage, making its presence known by its impatient *zee dee* often repeated; the Red-breasted Nuthatch regularly chooses this habitat; the Winter Wren utters its gushing song from the vicinity of brooks in this forest; the Black-throated Green Warbler and Black-poll Warbler occasionally disclose their presence by brief song or flutter of wing; at quarter-mile intervals the Red-eyed Vireo sings persistently; in the boulder-strewn ravines the Junco utters its monotonous rattle; and the Pine Siskin and Red Crossbill may occasionally be heard in the tops of the tall conifers. This list contains virtually all the birds frequenting the depths of a virgin forest here or elsewhere in the Adirondack region. (See plate 33.)

8. The Lumbered Clearing. South of the Camp, across Sucker Brook, lies an area of considerable importance in our bird quest, where the forest has been cleared by lumbermen some time ago. Unlike the Habitation Clearing, it has no buildings, or introduced forage grasses and weeds, and it therefore exhibits nature's methods of restoring injury when unaccompanied by human aid. The trees had been removed in the main, leaving the open area exposed to sunshine; and the prevailing vegetation is now berry-producing shrubbery grown breast high, and covering logs, stumps and small boulders, forming a tangle in the open spaces. There are also some tall deciduous trees, and several dead snags and boles. The birds of these clearings are much the same as those of the Habitation Clearing, excluding certain species especially attracted by buildings actually in use; and all sorts of birds visit it, as it borders the

lakeshore and affords good nesting places in some of the dead stubs and in the low thickets, and bears a profusion of fruit.

9. The Open Hardwood Forest. Besides the Lumbered Clearing across Sucker Brook, south of the Camp an area of dry open woods constitutes a habitat somewhat different from any yet described. Originally a part of the general forest, it was lumbered for conifers in an early day without greatly affecting the remainder of its tree life. Large shrubs or bushes are lacking, there is no tangle of ground cover and slash, and the ground is chiefly exposed, or covered with a layer of dead leaves. The floor plants consist of witch hobble, cinnamon fern and seedlings of the deciduous trees, maples largely predominating. These woods are not nearly so dark as was the original forest, since frequent openings were made by removing the conifers; neither is it damp nor moss-grown. Among its usual birds are the Golden-crowned Kinglet, Chickadee, White-breasted Nuthatch, Brown Creeper, Oven-bird, Black-throated Blue and Black and White Warblers, Blue-headed and Red-eyed Vireos, Scarlet Tanager, Wood Pewee, Crested Flycatcher, Flicker, Pileated Woodpecker, Yellow-bellied Sapsucker, and Downy and Hairy Woodpeckers (plate 30). These are active birds and their songs and call notes are more noticeable than in the darker woods.

10. Sucker Brook. Barber Point is formed by the intersection of Sucker Brook with the lakeshore (figure 139). The brook flows in from the east, the main stream averaging about twenty feet in width, and it is enclosed by trees and shrubs. Along the nearer portions of the Burn the brook tumbles over rocky shelves and boulders, but farther along, beside the Meadow it flows quietly through alders in a more level bed. It is obvious that the brook is not a habitat in itself; but as a secondary feature of the neighborhood it has an important influence. Its banks nourish the hemlocks: its shores, overhung with bushes, serve as coverts for shelter and bathing for the birds of the Burn and Clearing (figure 140), and its illuminated openings help diversify the surroundings. We find associated with the brook exclusively, only one bird, the Water-Thrush. If the brook were lacking this bird would probably not be present. Encroaching alders and fallen branches form pools (figure 141) near which is found the Water-Thrush, while Song Sparrows and White-throated Sparrows sing in the alders. Kingfishers nesting in the face of the sandbank at the Point make frequent excursions up the brook, and the Solitary Sandpiper shows a preference for its quiet pools. The Merganser, when its young are ready for the water, leads them up the brook for early lessons in the art of catching fish.

INFLUENCE OF CERTAIN FOREST TREES ON BIRD LIFE

To analyze more thoroughly the relations existing between birds and forests in the western Adirondacks, let us consider in detail each element of the Adirondack mixed woods, and the mutual influences exerted between them and particular species of birds. E. A.



Fig. 135. Meadow along Sucker Brook, bordering the dense, original forest. The stumps indicate the former character of area cut over. Ruffed Grouse, Hermit Thrushes and Olive-sided Flycatchers inhabit the evergreen forest.



Fig. 136. A Bog Conifer Clearing, showing typical bog shrubs, with tamarack saplings and dead tamaracks. Its open character makes this a favorite habitat for birds.



Fig. 137. A Bog Conifer area. The bog shrubs are interspersed with white pine on the slight elevations. A few broadleaf trees were left after lumbering. Favorite habitat of the White-throated Sparrow, Lincoln's Sparrow and Myrtle Warbler.



Fig. 138. Meadow Bog, at margin of dense conifer forest. Cleared bog forest at left, open meadow at right, and conifer forest in distance, furnishing three distinct habitats.

Sterling ('02, p. 18) suggests that we must look at a forest not as a mere collection of trees but as an organic whole, the result of actions and reactions among all the factors found within its limits. "The shade-enduring herbs and shrubs on the ground, the mosses and lichens on tree trunks and branches, and a host of other vegetable forms, are likewise a part of the forest whole, since they are products of and entirely dependent upon the natural forest conditions for their maintenance." It is in order that these complex and vital relationships may be more thoroughly understood that I present the estimates which follow, showing the relation between forest trees and the birds that frequent them. Dr. Frank M. Chapman ('03, p. 115) calls attention to their vital interdependence. "Certain forests have their natural insect foes to which they furnish food and shelter; and these insects, in turn, have their natural enemies among the birds, to which the trees also give a home. . . . Hence it follows that the existence of each one of these forms of life is dependent upon the existence of the other. Birds are not only essential to the welfare of the tree, but the tree is necessary to the life of the bird." We are clearly warranted, therefore, in believing that each kind of tree in the Adirondack mixed forest exerts an important and active influence in forming the association of birds belonging to the region; that certain birds are found there because certain kinds of trees or shrubs are dominant there, living not separately but in association. It is not the single birch tree that constitutes an attraction, but rather the birch as a participant throughout the Adirondack association that makes it effective upon the bird life in the region. For instance, the maple is a powerful agent in influencing bird life in an association; but I once knew a grove of forty acres of pure maple which did not attract a dozen species of birds in its summer prime. So also an extended area of nearly pure beech woods is almost a solitude in its expression of bird life; yet the beech, like the maple, is an invaluable constituent of the Adirondack forest.

There seems available only one method of estimating the proportional values of the relationships existing between any species of tree and the birds, and that is by a series of careful notes recording such relationships as are observed, and a general summary based on such data. It has been my method in bird study to make note of the kind of tree, shrub, or bush in which any bird under observation showed any activity of importance, either in locating its nest, searching for food, or selecting a favorite station for singing. For instance: "Dry Open Woods, July 7. Redstart's nest four feet up in a birch sapling in the periphery of a thick clump of birch saplings." Or: "Burn Lot, July 13. A male Chestnut-sided Warbler was gleaning insect food in a clump of fire cherry saplings and flying away with it, apparently to feed young." It is from multiplied records like these that the deductions and generalizations are made that follow in this report.

The Birch and the Birds. The white, paper, or canoe birch is found scattered throughout the Adirondack plateau, but tends to

fringe the shores of the lakes, streams and swamps at the lower levels. In the older woodlands the birch grows to a commanding height. Its fruit is a small, scaly, conelike catkin, which ripens in midsummer and clings to its place until late autumn. The yellow birch (*Betula lutea*) predominates in the forest farther back from waterlines, preferring dryer situations than its relative.

The small conelike catkin of the birch contains many flat seeds arranged along a stubby axis, which begin to ripen about the middle of July. Thereafter the birches receive visits from the Crossbills, which appear to know when the seeds are ready and frequent the trees irregularly as long as the supply of seeds lasts. During the last week of July the birch banquet is at its best, and at that time the crop on some trees in favored localities is thoroughly harvested. As a rule the calls of these birds can be heard when they are seeking the seed-bearing trees, but they are quite silent when feeding, or merely give utterance to a faint *quit*. In the season of 1916 four tall white birches were producing seeds on the campus at Barber Point. They bore plentifully, and I estimated that their crop sufficed for about three Crossbills a month, but other birds also visited them during that time and foraged there. Doubtless in many places the seed-bearing white birches were not visited so persistently and their seeds were permitted to remain until later in the season, forming a reserve supply. In the latter part of July Goldfinches, usually in pairs, also visit the birch trees for a part of their daily fare. On the ground under such a seed-bearing tree, can be seen in late summer the sprinkled small green scales of the catkins torn apart by the birds. Another visitor, later in the summer, is the Purple Finch. The birches also provide food for autumnal migrants and winter visitors. In describing the Red-poll in winter Dr. Mearns remarks ('80, p. 11) that "the swamps of birch trees that they inhabited, and on whose seeds they fed, were absolutely swarming with them. So great were their numbers that the supply of birch seeds soon gave out, and then they scattered over the entire region, feeding largely upon the seeds of the alder, and of various weeds." The same ornithologist also asserts that in winter the Goldfinch and the Tree Sparrow feed largely on birch seeds.

A very interesting relationship exists between the Yellow-bellied Sapsucker and the birches. The Sapsucker is a true woodpecker; but unlike its fellows it has developed a taste for sap and also the live inner bark, more especially that of the birch but also of most other forest trees. The Sapsucker drills a horizontal row of holes around a tree trunk, and later another row so arranged that one hole stands directly above another in the two series. From time to time additional openings are made in like manner, with the effect of vertical rows as well as horizontal, between which the sapwood becomes so injured that the tree is virtually girdled, or at least wounded in a way to induce premature decay. These holes, only deep enough to penetrate to the sapwood, become cavities in which sap accumulates in small drops, and the Sapsucker regularly visits



Fig. 139. Rocky shore of Sucker Brook Inlet, at Barber Point, showing character of mixed forest, mostly second growth saplings. Margin of lumbered clearing at left.



Fig. 140. View on Sucker Brook, showing tangle of vegetation along its banks. Dead birches at left, with living spruces beyond. A haunt of the Water-Thrush and Solitary Sandpiper.

them, spending much time in clinging to the trunk and alternately drinking the accumulating sap and enlarging the wells. A large tree thus affected will be frequented by several Sapsuckers very regularly in midsummer, and one or more juveniles may spend most of the day in such a tree. A family of Sapsuckers has several tapped trees within a convenient radius, and after the young are out of the nest their days are spent chiefly in loitering at one or another of them.

In estimating the apparently destructive effect of this habit of the Yellow-bellied Sapsucker we must consider the influence of the birches in the forest association, remembering that an undue proportion of any single element is likely to be as detrimental to the forest as is the lack of a certain species. As nearly as I could ascertain, at least six families of this woodpecker dwelt in the Barber Point neighborhood. No birch tree at the Camp had been materially injured. In the Partial Clearing four mature birches were regularly visited by Sapsuckers, and all showed old perforations, eight to fifteen feet above the ground, or higher. None of the four grew to full height, and none appeared to be bearing seed. The Sapsuckers were not making new holes in these trees, but were occasionally enlarging old perforations by chiseling into them and smoothing their edges. The one most persistently worked on was a tall, half-broken snag, with only a tuft of branches at its top, and this crippled remnant was the chief food resource for its Sapsucker family. I sought diligently for evidence of Sapsucker attacks on younger branches, but was unable to find any; and my conclusion is that these birds prefer to open old perforations rather than to make new ones. Most birches do not suffer seriously, and only a relatively small number of mature trees in a habitat are tapped at all. Frequently a Sapsucker will work industriously on the trunk of a mature birch for many minutes, seeking to extract a morsel of insect from its burrow, without any apparent intent of making perforations for sap. If even a small percentage of the attacked birches die, however, the Sapsucker thereby becomes an agency for the restriction of the species. It is certainly the cause of considerable local injury, but as the birch is a fairly constant constituent of the Adirondack mixed forest, and as the Sapsuckers' interrelations with it have long existed, there probably has come about a fair adjustment between the two. It is to be noted that the Yellow-bellied Sapsucker is not an inhabitant of dense woods, but rather of the forest margin, burns and open areas.

We are indebted to E. H. Forbush ('13, p. 122) for an account of the relation between the birds and the plant lice that infest the birch. "It is a widely known fact in Massachusetts," he records, "that practically all of the resident and migrant warblers eat the birch plant louse. It is only necessary for one to find a locality where these insects are numerous if he wishes to make sure of finding in their seasons about all the warblers that breed in that region or migrate through it, and also many other birds not ordinarily found

among the birches." His accompanying list enumerates 38 species of birds that feed on birch plant lice; and Forbush declares that undoubtedly the plant lice would considerably reduce the annual crop of birch wood and lumber were it not for the way in which their increase is checked by birds.

The following is a group of birds that I have noted as utilizing birches either as situations for nests or as the source of materials for their construction. The group may be designated as the birch-bark society, and is as follows: Red-breasted Nuthatch, Brown Creeper, Blue-headed Vireo, Pine Siskin, Redstart, Chickadee, White-breasted Nuthatch, the Bay-breasted, Parula, Myrtle, Magnolia, Black-throated Blue and Black-throated Green Warblers, Yellow-bellied Sapsucker, Downy Woodpecker, Red-tailed Hawk, Wood Thrush, Red-eyed and Warbling Vireos, Olive-backed Thrush, Sharp-shinned Hawk and Least Flycatcher. Birch saplings seem to be chosen in preference to any other kind of young tree as nesting places, especially by the Goldfinch, Cedar Waxwing and Olive-backed Thrush.

The Maple and the Birds. The sugar maple (*Acer saccharum*) is intimately associated with the birch and the beech, these together with the aspen, comprising the bulk of the Adirondack deciduous woods. Under ordinary conditions the maple grows tall and commanding, overtopping the other hardwoods and filling its allotted space with a spreading canopy of foliage. As a result of the extensive lumbering operations of the past, in which the conifers were removed, there are large areas where towering maples flourish. The small paired and winged fruits are developed in early spring, and are fine food for certain birds at a time when other vegetable fare is not yet available, as in the case of some species while they are moving northward, or are arriving in the early days of spring at their northern nesting habitat. The sugar maple does not rank with the white birch, however, since its seeds are produced at a time when such food is insignificant compared with the wealth of insect life then available; nor is the maple resorted to as much as the birch. The Rose-breasted Grosbeak, one of the finest songsters of the springtime and early summer, lives almost exclusively in the upper story of the maple and associated deciduous trees, and it then feeds extensively on the unfolding flower buds. Regarding this habit of the Grosbeak, we are justified in assuming that it is merely an agency by which the balance of nature is maintained, and hence the bird is not to be regarded as an injurious influence in the maple's life history. Our garden and shade trees are improved by culling the fruit buds early in the season so that the remainder may attain more perfect development in the fruiting period. The procedure is probably equally beneficial to forest trees, as the birds that feed upon their flower buds doubtless exert a "thinning out" influence that results in the production of more energetic seeds. The Purple Finch also eats maple blossoms frequently.

Maples offer convenient nesting places not only in the wilderness but in village streets and public parks. Here in the woods the Robin and other thrushes frequently lodge their nests on a maple's stout limbs. The Alder Flycatcher and the Wood Pewee choose its bare forks, and the Crested Flycatcher finds high natural cavities in aged trunks as suitable places to rear its broods. The Cedar Waxwing and Scarlet Tanager construct nests in the maple's shady canopy, and Vireos very commonly use a drooping fork in the lower outer twigs as a support for their pendent homes. As a foraging place and as a song station, the value of the maple is inestimable, for I find it to be patronized by a large proportion of the song and insectivorous birds of any neighborhood.

In its sapling stage, as a part of the aspen-fire cherry-birch association, there are found with the sugar maple the red maple (*Acer rubrum*), the striped maple or moosewood (*Acer pennsylvanicum*) and the mountain maple (*Acer spicatum*). These have much the same characteristics in burns and clearings, and all are favorites with birds. The Olive-backed Thrush nests in the upright crotches of a maple more often than elsewhere; and as a gleaning ground and quiet retreat for rest the young maple is probably of greater service than any other tree in its community.

The Beech and the Birds. The beech grows with a uniform cylindrical stem, and where the conifers have been cut away it spreads a spacious leaf canopy. Frequently, beeches equal the maples in height, especially along old sandy stream beds, although as a rule the maples surpass the beeches in bulk of trunk and extent of lateral branches. Both show the effect of early growth in close company with other trees, by their tall unbranched trunks and an abrupt spreading at the top, while the birches begin to send out short lateral branches farther down on the trunk and produce a spindle-shaped tapering mass of foliage. The fruit of the beech is a small bur containing two triangular nuts that ripen in late summer. The fruit clings to the stem after ripening, and often remains on the tree as an available food supply for animals during the winter.

For the purposes of the birds the beech ranks next to the sugar maple in value. The Robin, Tanager, Grosbeak and other singers avail themselves of its high twigs for their morning and evening recitals. The Kinglets, Chickadees, and Nuthatches glean from its trunk and branches for their insect fare; Warblers hunt for insects amid its foliage; the Red-eyed Vireo sings as it works among the leaves, and the Cedar Waxwing nests in a fork of its branches. In winter the Blue Jay harvests its food from its laden twigs, and woodpeckers drill through its bark for hidden beetles and larvae. As the maple is perhaps the more popular with the birds in the spring, so the beech is preferred in the fall because of its store of ripening fruit. The beech thus supplements the maple, and its flower buds are also a spring dainty to the Rose-breasted Grosbeak.

Dr. B. H. Warren found flowers of hickory in 11 Grosbeak stomachs, those of beech in 26, maple in 3, and other blossoms in 23 stomachs collected during May in Pennsylvania. McAtee ('08, p. 39) notes that no appreciable damage ensues from the bird's habit of feeding on the flowers of forest trees, since the fruits of these trees are of little economic value. "Moreover, it is noticeable that the fruit-producing or pistillate flowers are not the ones preferred, but the sterile staminate ones. These are produced in countless millions, and wither and fall away after a short season."

It is in autumn that the beech becomes really valuable to birds, for it produces the only nut fruit available in the Adirondack region; hence in the fall it attracts a class of feathered residents that otherwise might not be present at that time. White-breasted Nuthatches, Red-headed Woodpeckers, the Bronzed Grackle, Crow, Flicker, Wood Duck and Blue Jay eat them;—in fact, beech nuts in the absence of acorns, must serve as the main support of Blue Jays in the Adirondacks during the fall and winter. Approximately three-fourths of the annual food supply of the Blue Jay is vegetable matter, the greater part of which is mast. Merriam ('78, p. 124) reports that Red-headed Woodpeckers subsist almost exclusively on beech nuts, both green and ripened. "It is truly a beautiful sight," he exclaims, "to watch these magnificent birds, together with their equally abundant cousins, the Yellow-bellied Woodpeckers, creeping about after the manner of the Warblers among the small branches and twigs which bend low with their weight while picking and husking the tender nuts." Mrs. Fanny Eckstorm ('01, p. 57) reports that in Maine the Red-heads not only eat beech nuts in the fall, but store them up for the coming winter; and she adds the Downy and Hairy Woodpeckers to the list.

The Hemlock and the Birds. The hemlock is a handsome tree in its maturity, although usually less tall than the remaining pines. Originally it flourished extensively throughout the Adirondacks, but in the lumbered regions has practically disappeared except in the present second growth. It has an advantage in relation to its benefit to birds in its preference for streamsides and moist cool ravines, where birds naturally congregate because food is most abundant there, as well as good bathing places. Among those partial to the hemlocks are the Kinglets, Red-breasted Nuthatch, Chickadee, Winter Wren, about all the local Warblers, the Junco, Pine Siskin, Goldfinch, Purple Finch, Canada Jay and the two species of Crossbill.

The fruit of the hemlock is a small cone, usually less than an inch long, with thin, persistent scales, and matures the first year. In late summer the seeds begin to ripen, and thenceforth the hemlock is regularly resorted to by such birds as feed on conifer seeds in general, most of them winter residents. Dr. Mearns says in his "Birds of the Hudson Highlands" ('79, p. 204): "I used frequently to visit a certain dense grove of hemlocks, that was constantly inhabited by large flocks of Crossbills of both species, for the purpose of watching their singular habits. The White-wings

were somewhat shy and suspicious, and extremely restless, constantly flying from the top of one tree to another, and keeping up an incessant rattling cry; but the Red Crossbills were found in larger numbers frequenting the lower drooping branches, to which they clung in every variety of posture, gleaning busily the while, seldom roving about, and inclined to be noisy and chattering, though their notes are very unlike those of the other species, and more nearly resemble those of the European Sparrow. Their dexterity in extracting the seeds from cones is quite remarkable, and the shower of refuse materials sent down from a tree-top, is, of itself, sufficient to apprise one of their presence." Mearns also saw flocks of Purple Finches in March eating hemlock seeds, and the Pine Grosbeak, Pine Siskin and Goldfinch living on them largely in winter. Sapsuckers do not attack the hemlock as seriously as they do the birch, and their punctures do not produce such lasting injury as they do to hardwood trees.

The Spruces and the Birds. Two spruces belong to the Adirondack mixed forest, the red spruce (*Picea rubra*) and the black or bog spruce (*Picea mariana*). They are almost indistinguishable in certain periods of their growth, and are practically alike in their relationship to the birds. These spruces produce small pendulous cones with thin scales, which mature in one season and retain their conical form until they drop from the trees. Like other conifers, they yield a bountiful supply in some years while in others very few seeds are borne. The spruce has been nearly eliminated in many cut-over areas. Its birds are much the same as those seen about hemlocks. As a nesting site the spruce is not a general favorite. The Black-poll Warbler frequently makes its home in a small spruce, as do also the Magnolia Warbler, Myrtle Warbler, Chipping Sparrow, Cedar-bird and Purple Finch; and the Ruffed Grouse and Canada Spruce Partridge occasionally place their nests beneath its low, drooping boughs.

Certain of the birds above mentioned spend considerable time hunting for insects in the spruces, searching them little by little and flitting among their branches and twigs with diligent persistence. A small grove will furnish plenty of material for the foraging of a Myrtle Warbler or a Black-poll for several days. In fact, spruces seem to be more attractive for their insect supply than for their seeds, and most of the small birds resort to them. It is remarkable how many food morsels can be found by birds in a patch of spruces. A family of Kinglets will spend many minutes in getting a dinner there. As I consider this phase of my observations, I am led to note the significance of the fixed and definite associations that mark the relations of birds to their surroundings. Certain birds of a neighborhood quite regularly haunt the spruces, or the hemlocks, or the birches, or the maples. Why is this the case? Again, there are certain birds that we do not look for in the spruces, or the hemlock, or the birches, or the maple; but why are they not found in such associations? It would be quite irregular to find a Bluebird



Drawn by Edmund J. Sawyer

PLATE 31. BIRDS OF THE ADIRONDACK BURNED FORESTS

1, Flicker.

2, Olive-backed Thrush.

3, White-throated Sparrow.

4, Chestnut-sided Warbler.

gleaning from a spruce tree,—or a House Wren, or a Catbird, or a Rose-breasted Grosbeak, or a Rusty Blackbird, or a Wood Pewee.

In reviewing the records of observers in eastern Canada and in northern Maine it becomes evident that the spruce is there more commonly utilized than here as a nesting place, and its needles as nesting materials. The Magnolia Warbler especially seems to prefer this kind of tree for its home, and Gerald Thayer thinks that "Spruce Warbler" would be an appropriate name for it, quite as appropriate as "Birch Warbler" for the Nashville. "The Magnolia keeps to the spruces (and other conifers) at least as strictly as the Nashville keeps to the birches (and other broad-leaf trees). The feeding range or 'beat' of this Warbler in its chosen summer woodlands about Monadnock, lies between the tip-tops of second growth spruce trees and their lowest branches. Although not shy, it is apt to stick rather closely to the inner recesses of spruce clumps, less often showing itself on the outermost twigs than do the Blackburnian and Black-throated Green." The same might be said of the habits of the Black-poll Warbler in the same locality and northward.

The spruces are commonly infested with bark beetles and wood-boring beetles. I am reminded of a statement by McAtee ('15, p. 862) that the birds in general destroy large numbers of the bark beetles that are among the worst pests of our forests. "They feed just beneath the bark, forming tunnels which in many cases girdle and thus kill the trees." He asserts that "The spruce-destroying bark beetle has been responsible for the loss of many billions of feet of timber in the northeastern United States," and quotes Dr. A. D. Hopkins, of the United States Bureau of Entomology, in giving birds the credit for devouring this beetle, as follows: "The principal enemy of the spruce-destroying beetle, and other bark-infesting enemies of the spruce, consists of the Woodpeckers, which destroy, it is believed, from 50 to 75 per cent of the broods of the spruce-beetle in many hundreds of trees each year."

The Balsam Fir and the Birds. The fir (*Abies balsamea*) grows in the virgin woods in a tall, symmetrical form, sending upward a slender conical spire that pierces the surrounding canopy in marked contrast to the clustered foliage of the deciduous trees associated with it. Its distribution is general on the Adirondack forested plateau, and, like the spruce, in localities lumbered in an early day it has commonly reproduced itself by a vigorous second growth. This fir produces medium-sized cones that stand erect on the upper side of the branches. They reach maturity in the fall, and the seeds become a staple article of food for the birds in late autumn and winter. This tree ranks high as a favorite in the mixed forest in the several uses made of it by the birds, and it is probably visited by larger numbers in the course of a season than any other conifer. Birds freely select the fir for nesting sites, constantly search it for insects, and resort to it for protection and seclusion. The Cross-bills are characteristic birds of the balsam, eating its buds in the

spring and its seeds in the fall and winter. The movements and activities of the Crossbills are governed largely by the forest's supply of cones, hence these birds rove about much in quest of food, visiting the seed-bearing trees as they find supplies here and there to claim their attention. At their repasts in the balsams and other conifers the Crossbills detach many cones and also loosen many seeds which fall to the ground uninjured and later germinate. These birds, therefore, are agents in the distribution of conifers throughout the region. Besides the Crossbills, the Canada Spruce Partridge eats balsam buds in the spring; and it often makes its nest under fir trees, in the shelter of their low-drooping branches, as also does the Ruffed Grouse. The Olive-backed Thrush characteristically selects the fir as a situation for its nest, placing it on a horizontal branch against the main stem at a point about two-thirds the way up the tree. The Golden-crowned Kinglet commonly constructs its globular nest there, and the Cedar Waxwing often builds in the fork of a scraggy limb. The Chipping Sparrow, Pine Siskin, Crossbill, Purple Finch, Blue Jay and Canada Jay are also among Adirondack birds that freely nest in the fir, as do also various Flycatchers, Warblers, Woodpeckers, Nuthatches, Creepers, and even the Hummingbird and Sharp-shinned Hawk. I have found an equally long list of birds that make their homes among the branches of fir trees in northern Montana.

The White Pine and the Birds. In the original forest the white pine (*Pinus Strobus*) towered aloft in strength and dignity as the most important element of the mixed woods of the Adirondack region, and in the remaining areas of virgin timber the white pine is still a dominant figure. It is scattered quite generally throughout the Adirondack plateau, but thrives best on the sandy levels and in the valleys of ancient lakes and glacial stream beds. On extensive sandy areas as in the Champlain-Hudson drainage, it flourishes almost to the exclusion of other trees, making such a large proportion of the timber that it appears to be a pure stand. The seeds of the white pine are produced in long cylindrical cones that are found scattered about under the trees after they have opened and distributed their seed in the winds. The white pine is not as popular with birds as are other conifers. It is very unusual to find a nest in a young pine, its habit of growth in open situations perhaps making it rather too conspicuous for nesting sites, and its foliage affording little concealment. A small group of birds do resort to the white pine in summer, among them Kinglets, Chickadees, Nuthatches, Vireos, Brown Creepers, the Pine, Black-throated Green, Blackburnian and Myrtle Warblers, Pine Siskins, Crossbills, Pileated and Three-toed Woodpeckers, and the Broad-winged, Red-shouldered, Red-tailed and Fish Hawks. The larger birds of prey find the loftier pines excellent for nesting and for vantage points from which to survey the landscape. The list might be extended if one were to add all the birds that put its long needle-like leaves into the structure of their nests, or glean among its resinous branches, forming altogether an ecological group of great interest.

As the scales of the pine cones are large and stiff, only the larger of the winter seed-eating birds feed upon their seeds to any extent. Chapman ('97, p. 196) says of the Crossbills that "they feed almost entirely upon the seeds of pines." It has been my observation, however, that the Crossbills seek the seeds of the tamarack and fir in preference to those of the pine, though this may be explained by the great irregularity of the pine in the production of its seed. It has been asserted that the white pine can be relied upon to produce a crop only once in five or six years.

In forest nurseries, ground-feeding Sparrows, including the White-throated Sparrow, commonly destroy numbers of white pine seedlings as soon as they appear above the ground, eating the tender cotyledon leaves. Whether they do similar damage in the forest under natural conditions is a question.

Among the birds attracted to the white pine in search of certain insects, Forbush ('13, p. 161) mentions the Golden-crowned Kinglet as feeding on the eggs of the white pine louse; also that the Chickadee and the Downy Woodpecker kill many white pine weevils (*Pissodes strobi*) and their larvae which are very destructive to the tender leading shoots of young trees. Dr. Beal ('06, p. 245) informs us that about thirty-five species of the cerambycid and buprestid beetles feed on the pine tree; and shows that the Downy, the Hairy, and the Three-toed Woodpecker prey upon the larvae of these very destructive borers. If this tree was otherwise more attractive to birds it is probable that it would not suffer as severely as it does from insect attack.

The Tamarack and the Birds. Prominent in the swampy parts of the forest is the larch or tamarack (*Larix laricina*). Where undisturbed, it grows to a stately height, sending its slender spire far above its surroundings, and terminating in a symmetrical cone of foliage. It stands chiefly in bogs and at the edge of swamps and meadows, where its slender light-green foliage gives a pleasing variety among other darker conifers. It produces small cones, whose seeds are a staple food supply for seed-eating tenants of the forest, but it is irregular in yield. While not so much used for nesting sites as the other conifers, it is a favorite foraging ground for insectivorous birds. A well-developed, mature tamarack towering perhaps to a height of 100 feet, will include several clearly defined zones of bird activity. A Woodpecker may be working diligently on the lower portion of the trunk, a troop of Chickadees or Nuthatches or Kinglets at the same time gleaning industriously in the foliage a few feet above, and Crossbills or Pine Siskins feeding on the seeds near its top.

The Alder and the Birds. The speckled or hoary alder (*Alnus incana*) is met with wherever streams meander sluggishly through level territory, their banks clothed in a spreading tangle ten or twelve feet in height. Its fruit is a small scaly cone like that of the birch, which clings to its place on the branch throughout the winter. The alders form a cover for hordes of water insects,—mosquitoes, flies and the like,—and all the insect-catching birds resort to its



Fig. 141. A pool on lower part of Sucker Brook, formed by encroaching alders and fallen branches. Song Sparrows and White-throated Sparrows are commonly singing in the alder thickets, and the pool is the home of the Water-Thrush.

thickets. Rusty Blackbirds, after their young are on the wing, spend a great portion of the day there, where attractive food can be had for the taking, and remain until they migrate southward in the autumn.

The Aspens and the Birds. The American aspen (*Populus tremuloides*) and the large-toothed aspen (*Populus grandidentata*) occur both in company and separately. In most of the Adirondack region they are found chiefly in the sapling stage as components of an aspen-fire cherry-birch association on burned areas. Along rocky shores both aspens may attain a height of 50 or 60 feet. Their seeds ripen and fall to the ground early in the spring and apparently are not eaten by birds. The chief function of the aspens is to afford a cover or screen for other trees more favored as nesting sites. A birch, willow or maple sapling, growing amid aspens, is a common nesting place, chosen apparently because so well hidden. As a screen for the fire cherry, on whose fruit most of the birds of the Burn feed freely during its prime, the aspens play a very useful part, for without their shelter the cherry would be less freely patronized, especially by some of its visitors, notably the Thrushes and others of a retiring disposition. Young aspens are often attacked by the Sapsucker, which drills through the bark usually just below the lowest branches of the trees. Such perfora-

tions are made apparently by juvenile birds in late summer, and in many cases the aspens immediately begin to show signs of sickness and die in the fall.

The Fire Cherry and the Birds. The most characteristic element of the cleared and burned tracts, especially where dry, is the fire cherry or bird cherry (*Prunus pennsylvanica*). It is chiefly associated with the aspens, birches, maples and willows, all in the sapling stages. The fire cherry grows in clumps, and at its best in the western Adirondack region may become ten to fifteen feet in height. It forms no part of the original dense woods, but follows the clearing of the forest, particularly in openings that have been swept by fire. It produces a small red fruit, the fleshy part of which is thin and sour, in clusters that begin to ripen by the end of the third week of July; and for the following month or so these natural cherry orchards are favorite resorts for birds. After the middle of August, heavy rains are likely to beat off the fruit. It appears that the fire cherry is the most important source of summer bird food in the Adirondacks, as it is also a good foraging ground for the insect hunters.

The Mountain Ash and the Birds. This tree (*Pyrus americana*) does not usually attain more than the tall sapling stage. It grows best along the rocky shores of lakes, ponds and streams, or on the edges of bogs and swamps. It produces small berry-like fruit, in showy clusters ripening in the fall and remaining in place as a late autumn supply for various species of resident and migrating birds after the summer fruits have served their turn. Some birds leave their summer habitat as soon as their young are fairly well able to care for themselves, while others linger as long as there is suitable food and the weather not too severe. With the latter group the mountain ash berries are an important food, and also with such migrating birds as travel southward in a leisurely way, enjoying the bounties of nature as they go. These berries are the principal fare of Robins in the fall, but the supply is soon exhausted, as the birds are loath to leave a locality where there is an abundance of the fruit. The Catbird until late in the fall also skulks among the coverts where mountain ash berries abound. Eaton ('14, p. 10) tells us that a crop of mountain ash berries attracts flocks of Cedar Waxwings and Pine Grosbeaks; and that the Purple Finch shows a preference for these fruits in winter. This tree is one of many species tapped by the Yellow-bellied Sapsucker for its sap.

From this brief sketch it appears that each species of forest tree exerts its own particular influence upon bird life; and to some degree each component of a vegetation association is effective in attracting one or another of the group of birds recognized to be closely related to it. One element alone, as a pure stand of beech or a grove of maples, exerts but slight influence on bird life; but such an element combined with others may become an influence of vital importance.

ENEMIES OF ADIRONDACK BIRDS

Predatory Mammals. In the foregoing pages I have presented the favorable features of the western Adirondack forest as a summer habitat for birds. The North Woods was originally tenanted by predacious animals of many kinds which preyed on their weaker neighbors and among them were numerous species of birds. Most of these have been so thoroughly killed off and driven away that they are no longer a serious menace in the Adirondack woods, but some few remain. Wildcats, foxes, skunks, weasels, martens, squirrels, mice, snakes, hawks, owls, Crows, Jays and Cowbirds all destroy birds or their nestlings, but happily none of these is numerous in the Adirondacks, and some of them are so rare as to be negligible at least in the western area.

Men and boys, directly and indirectly, do more harm, perhaps, than any other bird enemy,—directly by shooting and by robbery of nests, and indirectly by destroying through their “improvements,” favorable and habitual haunts. The two carnivorous animals they bring with them—the dog and the cat—add a new and destructive feature to the predatory side of nature. Dogs undoubtedly find and eat the eggs of ground-nesting birds, and disturb them grievously when they do not rob them. Far worse than this, however, is the marauding house cat, now undoubtedly the worst enemy against which birds making homes anywhere near civilization have to contend. In the latter part of summer two kittens were brought to Barber Point and installed in the Camp kitchen. They at once began depredations upon the young birds just leaving their nests, and thereafter took one, two or three every day. Inasmuch as the cat is an introduced enemy of the birds, its ravages are more severe than those of natural enemies, particularly in the nesting season when birds are practically helpless against its craftiness.

The red squirrel, next to the house cat, is regarded by naturalists as the predator most harmful to birds. Dr. Merriam states ('86, p. 215): “The propensity to suck the eggs and destroy the young of our smaller birds is the worst trait of the red squirrel, and is in itself sufficient reason for his extermination, at least about the habitations of man. I have myself known him to rob the nests of the Red-eyed Vireo, Chipping Sparrow, Robin, Wilson's Thrush, and Ruffed Grouse, and doubt not that thousands of eggs are annually sacrificed, in the Adirondack region alone, to gratify this appetite. Therefore, when abundant, as he always is during the springs that follow good nut years, his influence in checking the increase of our insectivorous birds can hardly be overestimated.” Fortunately, this excitable little marauder is ordinarily not very numerous at Cranberry Lake, but its numbers vary from year to year. (Cf. Thoms. Bird Lore, Vol. 24, pp. 206-207, 1922.)

The Adirondack plateau forests lacks oaks, hickories, walnuts and chestnuts, hence the larger squirrels can not find the staple articles of their regular fare in this region. The beech is the only mast-producing tree. Where conifers abound, the red squirrel can ob-

tain an abundant supply of cones; but in extensive lumbered areas, the mature, seed-bearing conifers have been nearly eliminated, so that the food supply of the red squirrel there has been much reduced and its range has been restricted to patches of virgin timber. About Cranberry Lake this squirrel shows a preference for seeds of the tamarack and the fir, and where these are scarce it must depend mainly on beech nuts. It is only where beeches grow that the red squirrel is found in the open woods.

The chipmunk is also accused of robbing birds' nests, but its forays seem to be rather an occasional yielding to temptation than a persistent habit.

Undoubtedly all the small carnivores avail themselves of any chance to get a meal of birds' flesh or eggs; but they are few here. Weasels alone remain numerous, and these sly, lithe creatures, able to make a quick pounce on a sitting bird, to climb the larger trees, and to worm their way into hiding places, are inveterate nest robbers. Weasels doubtless destroy scores of bird families every season, attacking even Grouse. To a less extent the fox, lynx, mink, skunk and raccoon are foes of birds, especially game birds and others that make their homes on the ground. Observers differ as to the mischief done by the raccoon. It is one of the commonest mammals of the Cranberry Lake district,—three were caught in one night at the Camp in a figure-four box trap,—but I could not see that the raccoons molested any of the many nests occupied by bird families in the surrounding woods and clearings. Porcupines and woodchucks were also numerous but apparently entirely harmless to birds. Eaton ('10, p. 234) brands the mink as a "most inveterate nest-robber." As to the marten, probably scarce in the lumbered districts today, Stone and Cram ('10, p. 243) say that "martens kill all sorts of birds and animals indiscriminately." Of the skunk they say nothing definite in this respect, but this animal will no doubt take what it finds in nests built on the ground; and fortunately it is not numerous in the western Adirondacks. Finally, Stone and Cram accuse the white-footed mouse, which is fairly common in this region, as follows ('10, p. 132): "In summer they appropriate the nests of songbirds, in bushes and low trees, fitting them up for use, just as squirrels do those of Hawks and Crows. It appears probable, moreover, that they are not over-scrupulous in the matter of waiting for the rightful owners to depart before taking possession, as they are great lovers of fresh meat, and have often been caught in the act of devouring both eggs and young birds."

Predacious Birds. Birds of prey are not common in the Adirondack mixed forest. I saw at Cranberry Lake only the Bald Eagle, Fish Hawk, Marsh Hawk and Broad-winged Hawk, none of which molests nesting birds. The Great Horned Owl was reported to me as living in the woods at Barber Point, but it certainly is not common. The Owl, with the Goshawk, the Sharp-shinned Hawk and Cooper's Hawk, are the recognized enemies of the birds, and all are too rare to be reckoned as important in that locality. This scarcity

of the large birds of prey means that their customary food, the small rodents, is not plentiful. The chipmunk is rather common, it is true, and it feeds in the burns and clearings alongside of the birds without exciting their interest. Its presence and that of the red squirrel may account for the occurrence of the Broad-winged Hawk. But the small rodents, ordinarily enemies of nesting birds, are evidently not prominent as an influence in the region.

Certain other birds, however, are more annoying and baneful to the small songbirds than are the so-called birds of prey; but fortunately, these also are restricted in numbers throughout the western Adirondack region. Eaton ('10, p. 53) reports that in the State of New York Crow Blackbirds, Shrikes, Crows and Jays kill smaller birds. "The three last mentioned are especially destructive to eggs and young birds. I have known many instances of Crows carrying away Robins and other young birds when nearly ready to leave the nest, and have seen Crow Blackbirds follow and kill young Robins which were able to fly several rods. I once saw a Bittern followed so hotly by a troop of Red-wings that she dropped the young bird which she was carrying away to her nest, and on examining the victim I found it was a Red-winged Blackbird, fully fledged, which the Bittern had speared through the side with her daggerlike beak. There is little doubt that the callow young of our perching birds are devoured by numerous flesh-eating species. The mortality among eggs is even greater than among the nestlings. Many species of otherwise inoffensive birds become egg-eaters during the nesting season. Blackbirds, Cuckoos, Catbirds and Wrens invade their neighbors' nests and destroy their treasures. Crows and Jays are probably the worst destroyers of eggs and nestlings, and I have seen the Crow on so many occasions in this nefarious business that I doubt if I could ever consent to regard him as a reputable citizen. The Cowbird is fully as noisome a pestilence from the standpoint of bird protection, for every young Cowbird is reared at the expense of a whole brood of vireos, warblers, finches or some other songbird."

Other writers have recorded the destructive propensities of many birds that do not belong to the raptorial group. Burns ('00, p. 66) mentions the fact that the eggs and callow young of the Flicker are sometimes destroyed by the Red-headed Woodpecker, the Crow, the Fish Crow and the Blue Jay. Forbush ('13, p. 370) records that the English Sparrow "has repeatedly been seen to destroy the nests of other birds, break their eggs, kill their young, mob them and drive them away from their homes. It occupies the houses of Bluebirds, Martins, Swallows and Wrens, and the nests of Barn Swallows, Cliff Swallows and Bank Swallows, and by persistency and force of numbers, drives the owners away. All careful observers who have watched the Sparrow ever since its introduction and have noted the effect produced upon other birds by its presence, agree that it is pernicious." These birds do not yet appear to be significant factors as enemies of the birds in the Cranberry Lake region. The Crow is represented only by a family here and there:

the Raven is so rare as to be negligible, and the Canada Jay is merely a chance straggler. The Blue Jay is a regular inhabitant of the margins of the wood but is not numerous; the Bronzed Grackle is uncommon, and the Cowbird is apparently absent from the plateau country, though it might be expected to follow the bush-dwellers into the higher clearings.

Snakes as Enemies of Birds. Another circumstance rendering the western Adirondacks a desirable summer habitat for birds is the comparative scarcity of snakes. The garter snakes are not greatly addicted to taking young birds, but some of the larger and more aggressive species make a practice of thus adding to their daily bill of fare in the bird-nesting season. Chief in the category of predatory snakes elsewhere is the blacksnake, which is absent from this region, as also is the rattlesnake. Most snakes feed mainly on small rodents, particularly meadow mice; and these, as I have already said, are few about Cranberry Lake, a fact that may partly account for the scarcity of serpents, as I suppose it does for the fewness of hawks and owls.

The Role of Predatory Species. It may not be altogether a blessing to bird life when natural enemies of every kind are lacking in their environment. Forbush ('16, p. 7) formulates a broad statement on this point as follows: "It is well known to naturalists that in a state of nature the natural enemies of any species are as essential to its welfare as are food, water, air and sunlight." He explains this principle as follows:

(a) Natural enemies regulate the numbers of animals.

(b) Natural enemies preserve the fitness of the animals on which they prey.

(c) Some natural enemies regulate others.

(d) Useful species may become harmful if not held in check by natural enemies.

(e) Natural enemies supplement and check one another.

(f) Natural enemies tend to keep the numbers of birds at their normal limit.

Forbush concludes that the natural enemies of birds are necessary and desirable as they tend to maintain within proper bounds the numbers of the species on which they prey; he also suggests judicious and moderate limitations upon the activities of the natural enemies, that the biological balance may not be disturbed by man's unwise intervention.

A CENSUS OF THE BIRDS AT CRANBERRY LAKE

A part of my plan for the season's work (1916) was a definite census of the bird life of each minor habitat, and by a combination of these to make an approximate estimate of the bird population of the region. Great difficulties were encountered in this work. The shrubbery grows breast high in all open spaces and the topography is chiefly of glacial formation, with ridges and depressions strewn with boulders of all sizes, the smaller ones usually hidden by bushes

with fallen logs, stumps left from early lumbering operations, and roots of up-turned trees, all forming a tangle so discouraging that a close search of even one local habitat would involve an entire season's sole and exacting labor. In these circumstances, to get a fair idea of numbers in the limited time available—the last half of the nesting period—it was deemed best to select typical portions of each minor habitat. At the time of my arrival at the Summer Camp, June 22, many of the birds of the neighborhood were feeding their young in the nests, or else had their first broods already on the wing, and July was well begun before the areas were exactly defined. Ordinary methods of making a census of birds in open country were here impracticable, and I had to devise one for the case in hand. Day after day the number of singing males in an area was estimated, generally early in the forenoon and frequently towards the end of the afternoon, when the songsters are at their best. Adult birds caring for young either in the nests or on the wing in the shrubbery, were regularly noted in each area, until nearly every family was approximately located and its movements known. One unfamiliar with an Adirondack burned tract or clearing of any kind, or with the ordinary bog or bog forest, can scarcely realize the meaning of a task involving a detailed search for nesting birds in one of these typical habitats. Berry thickets grow in a dense tangle, and overturned trees interpose masses of roots clogged with soil and rock fragments, thus shutting off the view ahead, and offering barriers skirted or surmounted with toilsome effort (figure 129); while hidden cavities of all sorts form pitfalls into which the searcher is continually sinking leg-deep.

The Campus and its fringe of trees and bushes comprise approximately 4 acres. The following birds nested in this area: Robin, 1 pair; a White-breasted Nuthatch roosted regularly in a hole at the top of a dead stub, but was not nesting there at this time; Red-eyed Vireo, 1 pair, 2 broods; Cedar Waxwing, 3 pairs; Bank Swallow, 10 pairs, in the sandbank margin facing the Lake; Song Sparrow, 2 pairs; Slate-colored Junco, Chipping Sparrow, Alder Flycatcher and Kingfisher, 1 pair each. These figures show a total of 10 pairs, an average of 2.5 pairs to an acre; or, by including the sandbank birds, we have 21 pairs, making an average of more than 5 pairs to the acre.

In the Partial Clearing, of about 4 acres, were found nesting: Robin, White-breasted Nuthatch, Brown Creeper, Catbird and Mourning Warbler, 1 pair each; Chestnut-sided Warbler, 2 pairs; Black-throated Blue Warbler, 1 pair; Red-eyed Vireo, 2 pairs; Rose-breasted Grosbeak, Song Sparrow, Least Flycatcher, Wood Pewee and Yellow-bellied Sapsucker, 1 pair each; or 15 pairs in all.

The Habitation Clearing measures approximately 8 acres, and its nesting residents were as follows: Olive-backed Thrush, 2 pairs; House Wren, 2 pairs; Catbird, 1 pair; Redstart, 2 pairs; Yellow-throat, 3 pairs; Chestnut-sided Warbler, 1 pair; Nashville Warbler, 1 pair; Red-eyed Vireo, 1 pair; Cedar Waxwing, 2 pairs; Rose-

breasted Grosbeak, 1 pair; Song Sparrow, 2 pairs; White-throated Sparrow, 3 pairs; Goldfinch, 1 pair; Bronzed Grackle, 2 pairs; Least Flycatcher, 2 pairs; Kingbird, 1 pair. This census shows 26 pairs.

In the Burn a typical space in the center was selected, where there was a depression, or great kettle-hole, in and around which grew several tall living trees, chiefly maples. This measured area contained 10 acres, and its nesting birds were as follows: Robin, Olive-backed Thrush, Chickadee and White-breasted Nuthatch, 1 pair each; House Wren, 2 pairs; Redstart, 1 pair; Canada Warbler, 1 pair; Yellow-throat, 2 pairs; Chestnut-sided Warbler, 3 pairs; Nashville Warbler, 2 pairs; Blue-headed Vireo, 2 pairs; Red-eyed Vireo, 1 pair; Cedar Waxwing, 2 pairs; Song Sparrow, 2 pairs; White-throated Sparrow, 8 pairs; Goldfinch, Ruby-throated Hummingbird, Least Flycatcher, Flicker, Sapsucker, Hairy Woodpecker and Canadian Ruffed Grouse, 1 pair each. This estimate makes a total of 37 pairs in the 10 acres.

The Bog adjacent to the Burn, and including a strip of second growth conifers with some remnants of original hardwoods, comprised approximately 9 acres. The nesting birds of this lot were as follows: Veery, 2 pairs; Chickadee, 1 pair; White-breasted Nuthatch, 1 pair; Canada Warbler, 1 pair; Myrtle Warbler, 3 pairs; Blue-headed Vireo, 1 pair; Cedar Waxwing, 2 pairs; Lincoln's Sparrow, 3 pairs; Slate-colored Junco, 1 pair; White-throated Sparrow, 7 pairs; Purple Finch, Yellow-bellied Flycatcher, Olive-sided Flycatcher, Flicker, Sapsucker and Arctic Three-toed Woodpecker, 1 pair each; a total of 28, or 3 pairs to an acre.

For the Virgin Forest count, an area of about 5 acres was selected, lying along the line where the Bog and the Meadow converged. It held the following species: Hermit Thrush, 3 pairs; Golden-crowned Kinglet, 1 pair; Red-breasted Nuthatch, 1 pair; Winter Wren, 2 pairs; Red-eyed Vireo, Magnolia Warbler and Black-poll Warbler, 1 pair each; or 10 pairs in all.

The long narrow Meadow tract comprised a fraction over 8 acres, and contained the following tenants: House Wren, 2 pairs; Maryland Yellow-throat, 7 pairs; Cedar Waxwing, 1 pair; Song Sparrow, 6 pairs; Chipping Sparrow, 1 pair; Rusty Blackbird, 1 pair. Here we find 18 pairs of birds.

In the Lumbered Clearing, a bushy area of 6 acres near the lakeshore was selected for counting. Its nesting birds included one pair each of Olive-backs, Redstarts, Canada Warblers, Yellow-throats, Mourning and Nashville Warblers, Red-eyed Vireos, Cedar-birds, Least Flycatchers and Crested Flycatchers; and of Chestnut-sided Warblers, 4 pairs; Song Sparrows, 2 pairs; and White-throats, 2 pairs; 19 in all, or about 3 pairs to the acre.

A representative patch of about 7 acres in the Open Hardwood Forest furnished this list: Chickadee, 1 pair; Winter Wren, 1 pair; Black-throated Blue Warbler, 3 pairs; Blue-headed Vireo, 1 pair; Red-eyed Vireo, 2 pairs; Scarlet Tanager, Wood Pewee, Yellow-bellied Sapsucker, Flicker, Junco, and Black and White Warbler, 1 pair each. This estimate shows 14 pairs in 7 acres.

Reviewing these statistics, it appears that in 1916 an average of about three pairs of woodland birds nested on an acre in the region surveyed. The burned tract appears to rank first as a preferred habitat, and the virgin forest gave fewest families.

I have at hand a report by Wells W. Cooke concerning bird counts in various localities, among them several made in woodlands, and to these I briefly refer for comparison. He states ('16, p. 9) that "in the mountains of Arizona, near Flagstaff, a tract of 70 acres at about 7,100 feet elevation, covered with western yellow pine and Gambel oak, supported a bird population of 31 pairs of 18 species." Also, along the shore of Flathead Lake, Montana, 45 acres of woodland had 67 pairs of 24 species. Again, "a 60-acre tract of wooded hillsides near Gilroy, California, was supporting 36 pairs of 10 species." The foregoing data indicates that the western part of the Plains, the Rocky Mountain region, and the Pacific slope contain a smaller number of birds per acre than the Eastern States under nearly similar conditions. From all the evidence submitted, I am warranted in concluding that the Adirondack region holds a leading place among forest habitats as a summer home for birds.

A LIST, WITH NOTES, OF THE SUMMER BIRDS ABOUT CRANBERRY LAKE

The making of the subjoined list was not the motive of my work at the Forestry Camp on Cranberry Lake, but incidental to it, and more species might have been recorded during the period given to my observation — June 22 to August 20, 1916 — had that been the primary object. In the notes regarding each species special attention had been given to the local factors determining habitat preferences rather than to so-called zones of life, for the reason that all the birds herein enumerated are practically included in the one general type of mixed forest in one or another of its varying aspects. My concern was chiefly with the land birds, as dwellers in the forest, little attention being paid to the water birds, which in fact are few about such a typical forest lake lacking in water plants. Cat-tail swamps, with areas of open water margined by reeds and rushes, are rather rare in the western Adirondacks. The water birds of the region can therefore all be accounted for either as those nesting usually in tree cavities, as do the Merganser and Wood Duck; or those feeding principally on fish, frogs and related kinds of food, as the Heron and the Loon. Moreover, the influence of the Ontario-Oneida water plain on the west, and of the Hudson-Champlain waterway on the east, both attractive to the aquatic birds of northern New York, might serve to lessen their frequency here.

The list includes a few species (indicated by an asterisk) not directly observed by me in the season of 1916, but which occur more or less regularly throughout the western Adirondack region and are noticed to some extent in the course of travel through the Park. The records are well authenticated, but as a rule the birds mentioned

are not common, nor represented by many individuals. The absence of a certain group of them, including the Acadian Chickadee, Gray-cheeked Thrush, Blackburnian Warbler, Parula Warbler, Pine Siskin, Raven, Canada Jay, American Three-toed Woodpecker and Canada Spruce Partridge classed as belonging to the Canadian fauna, can be accounted for when we remember that they prefer the purely coniferous associations. To these birds the broadleaf trees are an effectual barrier, and they scarcely occur even in mixed forests in which the deciduous trees are in the minority. Moreover, the conifers in their climax growth have little attraction for the species of this group, which seem to prefer swamps, bogs, thickets of second growth, and other altered aspects of the forest rather than the original or "virgin" woods. The absence of these birds in summer at Cranberry Lake indicates the predominance of the so-called Alleghanian influence there. On the other hand, the long list of warblers in this lake district gives it a somewhat Canadian aspect; but it is idle here to speculate on the question of the limits of zoological zones.

The scarcity of birds of prey is noticeable, and has been commented upon elsewhere. Woodpeckers abound, for many features of the region make it an attractive habitat for these birds. The extensive burns are littered with standing dead trees and stubs suitable for their nesting holes, and the mixed forest contains the food sought by these woodland foragers. Flycatchers are also numerous and well sustained. The alder swamps teem with water-bred insects, as do the bogs; the *Sphagnum* is a breeding place for mosquitoes and small flies, midges, "punkies" and various other pests; and the decaying stumps, ground litter, and low growth of burns and clearings harbor hordes of insect prey. Of the finch family I find one group well represented, and another group but meagerly so. The first group includes those feeding on the tree seeds and shrub fruits; the second consists of sparrows of the open fields and meadows. In the former association we have the Purple Finch, the Crossbills, Goldfinch, White-throated and Chipping Sparrows, Junco, Song Sparrow, Lincoln's Sparrow and Rose-breasted Grosbeak. To the sparrows of fields, pastures and short-grass meadows, the region offers no suitable conditions, and hence they are represented only sparingly and locally at the lower elevations.

*BLUEBIRD. *Sialia sialis sialis* (Linn.)

Length 7 inches. Above, azure blue; below, reddish brown; vest white.

The Bluebird was not seen by me at Cranberry Lake, but I am told that a pair had nested at Barber Point previous to my visit. The Bluebird was well known to the generation now passing, but has not been so familiar to the youth of today. Once it nested in every village and farm garden; then it gradually forsook these domestic scenes and made use of fence posts along secluded roads

* Indicates a species not directly observed by the author, but reported by others from this region.

and stumps in woodland clearings. Although recently the Bluebird has become more generally noticeable, it is doubtful whether it will recover its former place of familiarity about houses.

ROBIN. *Planesticus migratorius migratorius* (Linn.)

Length 10. Upper parts slaty brown; head darker; breast chestnut-red; vent and corners of tail (shown in flight) white.

The Robin is associated with clearings or with woodlands in the vicinity of human haunts. In the early weeks of spring the Robin is a bird of the lawn, dooryard and garden, where it seeks the earthworms and similar food then abundant near the surface of the ground, and where water is at hand for bathing and mud for its nest. In the middle of the summer it resorts more to fruit gardens and berry patches, especially while it is feeding and training its young. After the garden fruits and berries have failed, in the late fall, the Robin hunts in the wild woods and ravines. The singing of the Robin, as of other birds, is an accompaniment of the breeding season, and is continued until the young of the last brood leave home. In the Cranberry Lake district most of the second broods of Robins are on the wing by July 25, and then Robin music ceases, and the harsh squeaks of the juveniles betray their presence in the fire cherry and berry thickets. About July 20, elderberries are ready and raspberries begin to ripen. From that time Robins in the Adirondack region haunt the fruit-producing areas, flocking together more, and thus pass the remainder of summer until the end of August, after which they devote themselves to the mountain ash and other late supplies of wild fruit, but avoid the depths of the forest. The nest of mud and dried grasses and plain greenish blue eggs of the Robin are well known. The highest site I have ever seen was on a maple limb about forty feet above the ground.

HERMIT THRUSH. *Hylocichla guttata pallasi* (Cab.)

Length 6.5. Smallest of the Thrushes; back and sides, brown; tail rust-red, often tilted up and down; lower surface white, with rows of arrow-head-like black marks except on throat and belly.

Wherever a patch of virgin woods borders a bog or burn, the Hermit Thrush may be heard at almost any hour of the day during its song period; and where the dark forest contains openings of sphagnum moss, or is rankly overgrown with cinnamon fern in small illuminated spots, there the Hermit Thrush dwells and sings and rears its brood. In such places there are frequently large boulders carpeted with green mould and supporting a thick growth of fern, and in such sites the Hermit Thrush often makes its nest, the top of the boulder giving it a sheltered vantage point and the clustering fern affording concealment. Frequently the Hermit Thrush will make its nest somewhat outside the forest margin, in the base of a fern-clump or bush, or on a mossy, sheltered log, yet seldom far from the borders of the forest. The nest is sunken in the moist earth, among the grasses and ferns; composed of fine rootlets, hemlock twigs, forest leaves, mosses, fine weed stems and grasses, and

lined with pine needles and very fine black rootlets and grass tops. The eggs are pale greenish blue. It sings and gleans its food well within the shaded cover, but so near the open that the bird occasionally can be seen before it darts swiftly from view.

The singing of the Hermit Thrush is quite distinctive and characteristic and its tones are often compared to those of a flute. Many persons confuse the Hermit's songs with those of the Wood Thrush, but there is such uniformity in the singing of the latter and so much more variety in the Hermit's, that the identity of the songster should not be long in doubt to discriminating listeners. When the Hermit Thrush is heard at a distance its notes have a mellow, flute-like quality, but when the songster is near by one hears high-pitched, falsetto tones, somewhat squeaky and faltering, as if the performer were attempting to repeat some of his phrases an octave higher, and found them quite beyond his compass. A harsh alarm call is uttered when the bird is lurking in a thicket and is disturbed by an intruder. I have heard this call only in the virgin woods, and to my ear it sounds something like the scolding note of the Red-eyed Vireo or the Canada Jay. This Thrush's song period is prolonged until the middle of August, somewhat later than that of either the Olive-back or the Veery.

OLIVE-BACKED THRUSH. *Hylocichla ustulata swainsoni* (Tschudi)

Length 7. Back and flanks olive-brown; tail without rust-red tint; sides of head and breast buffy; breast crossed by a band of wedge-shaped spots; throat and belly white.

Abandoned lumber clearings with clumps of mixed saplings including balsam firs, are frequented by the Olive-backed Thrushes, as they prefer to nest in young evergreens. The singing of this Thrush is one of the early morning and evening pleasures offered the visitor at Cranberry Lake in midsummer, and it is distinctly different from that of either the Hermit or the Veery. The notes have a bell-like quality easily distinguishable. The song period is shorter than that of either of the others, as the young are usually out of the nest by the middle of July, and the males cease to sing soon after the juveniles are on the wing. Both adults and juveniles then frequent the burns and clearings where fruit and berries are plentiful.

The nesting of the Olive-back begins in June and its habits then are remarkably uniform throughout its entire range. The favorite situation for the nest is a crotch in a fir or maple sapling less than ten feet from the ground. The nest rests on a foundation of loose grasses, and its walls are made of dried grasses, green lichens, and fine weed stems. The lining is generally of fine grass, horsehair, and a little moss. The eggs are light greenish blue. The open nidification of the Olive-backed Thrush is seemingly at variance with its shy, secretive disposition, and the sitting bird generally lingers with her charge until she is certain that the observer means to disturb her; then she flits from the nest and disappears in the shrubbery, where she lurks in silence or occasionally manifests her anxiety by the characteristic *whit* from a hidden covert, while the male goes

on singing. In many instances the nests are quite unconcealed. The young hatch about July 1 and are fed in the nest by the parents for two weeks. The presence of an Olive-back in a district is revealed by the alarm call at nightfall,—a short, gurgled note like *guut* or *whut* heard chiefly toward dusk, and also about its nest when disturbed. The alarm note is a sure means of identifying this Thrush.

WILSON'S THRUSH; VEERY. *Hylocichla fuscescens fuscescens* (Steph.)

Length 7.5. Back, wings and tail *cinnamon-brown*; breast buff with faint marks; surface below, pure white.

The Veery is an inhabitant of boggy clearings, or wherever there are open sphagnum woods. It favors the mossy portions of an ill-drained open knoll, where upturned roots have left cavities for sphagnum growths, with great clumps of cinnamon fern spreading in the sunshine among clumps of small conifers, hardwoods and bog shrubs. In the neighborhood of Barber Point, up Sucker Brook, three sharply defined areas are illustrative of the habitat preferences of the local Thrushes. The Burn, with its aspen-fire cherry-birch association, is a characteristic haunt of the Olive-backed Thrush; alongside the Burn, and abruptly joining it, is a bog forest, the home of the Veery; and alongside the Bog, by a change as abrupt as the other, is a strip of dark virgin forest where the Hermit Thrush dwells.

The singing of the Veery is as distinctive as that of either the Olive-back or the Hermit. Its peculiar quality is its vibrant character, like the sound of a fine piano wire set in vibration and dying away of its own accord. The phrases of the Hermit end somewhat abruptly, while those of the Veery vibrate lower and fainter to the utmost diminuendo. For close comparison I would say that the songs of the Hermit are identified by their mellow, flute-like tones; those of the Olive-backed Thrush by their ringing, bell-like quality; and the Veery's by their resemblance to the tones of a fine, taut wire vibrated under a bow and allowed to come to rest.

Glover Allen says of Wilson's Thrush in New Hampshire that "numbers follow back the little side streams well up on to the mountainsides, so that it is possible in some places to hear the Hermit, the Olive-backed and Wilson's Thrushes all singing at once." This is in agreement with similar observations that I made in 1916 at Cranberry Lake, where all were present together. Allen's description shows that the three species were occupying overlapping habitats depending upon the vegetational association each preferred, while my observations indicated that they were choosing customary environments at the same altitude.

The nest of Wilson's Thrush is generally made on the ground, on a moss-covered log, or on a low humus-covered rock. One that I examined was on a low flat rock amid moss and shrubs. It was made chiefly of coarse fern stems, and was situated near the base of a clump of ferns. Frequently the nest is made on a foundation



Drawn by Edmund J. Sawyer

PLATE 32. CHARACTERISTIC BIRDS OF THE BOG CONIFER FORESTS

- | | |
|----------------------|----------------------------------|
| 1, Veery (Thrush). | 4, Arctic Three-toed Woodpecker. |
| 2, Magnolia Warbler. | 5, Myrtle Warbler. |
| 3, Lincoln Sparrow. | |

of dead leaves that have lodged in the base of a clump of sprouts or saplings, or at the base of a branch standing upright on a prone log.

GOLDEN-CROWNED KINGLET. *Regulus satrapa satrapa* Licht.

Length 4. Crown orange and yellow, bordered by black.

The Golden-crowned Kinglet is closely associated with spruces, balsam, tamarack and hemlock. In late summer, after the young are on the wing, a family group will hunt restlessly in a clump of spruce or fir for many minutes, flitting from twig to twig after the manner of Warblers in feeding, and uttering their thin-voiced *see-dce*, accented on the second syllable and repeated two or three times. In its busy life the Golden-crowned Kinglet associates with the Chickadee and the Red-breasted Nuthatch, the last named being as characteristic of the virgin woodlands as the Kinglet itself. As a rule, the Golden-crowned Kinglet prefers well established second growth to undisturbed primeval forest, very old burns that have been fairly recovered with mixed woods in which the conifers predominate being perhaps the first choice of this diminutive dweller of the woods. It chooses the fir as its usual nesting place, and forms a cradle of moss, lined with feathers or fur, that partly hangs beneath the fork at the end of a drooping branch. The eggs are creamy white, profusely spotted.

CHICKADEE. *Penthestes atricapillus atricapillus* (Linn.)

Length 5.5. Light gray and white, with a black cap and throat; flanks brownish.

The Chickadee hunts in all kinds of places and on every sort of tree, but seems to prefer hardwood scrub. It calls its name every few moments and also utters a quiet little phrase somewhat like *tsick-a-dce-purrt*, variously modified, and heard when several are foraging in company. In the mating season or when the Chickadee desires companionship it calls *pee-wee* in a slow, plaintive tone, each syllable lengthened and the first emphasized, which amateurs frequently mistake for the call of a Woodpecker or a Phoebe. A good imitation of this will often bring a solitary or curious Chickadee within arm's length of the whistler. The nest is made in a natural cavity in a tree, or more often in a Woodpecker's abandoned nest-hole, and contains sometimes as many as eight red-speckled eggs.

The Hudsonian Chickadee has been reported in this western district, but I did not see it.

RED-BREASTED NUTHATCH. *Sitta canadensis* Linn.

Length 4.6. Bluish gray above, reddish brown below; black stripe through the eye and white line over it.

This Nuthatch is naturally a bird of the higher virgin forest, and here frequents its margins, near open places. Its piping nasal call is one of the regular sounds of the woodlands, frequently interrupted by the louder scolding of the red squirrel or the rippling song of the Winter Wren. When a patch of virgin forest is bord-

ered by open, culled woods, this Nuthatch can be heard from the dense timber while the White-breasted Nuthatch utters its call from the scattered trees of the more open area. The difference in the calls is very noticeable, those of the White-breasted being deeper, hoarser, and more throaty than the notes of the Red-breasted, which do not seem to have the *nk* quality so noticeable. Both Nuthatches make their nest in holes and crevices of trees and lay red-speckled eggs; but that of the Red-breasted is distinguished by a daubing of resin about its entrance.

WHITE-BREASTED NUTHATCH. *Sitta carolinensis carolinensis*
Lath.

Length 6. Upper parts grayish blue; crown and nape black; *under surface white*; vent reddish; outer tail quills with white patches.

The White-breasted Nuthatch is a bird of the open, cleared spaces, where it seeks its food on large trees; and it nearly always chooses the hardwoods, alive or dead, for its foraging, and works with great diligence and patience. It utilizes a hole in a stump or tree as its sleeping quarters for the night. A White-breasted Nuthatch had a cavity which is used in this manner, a hole made by a woodpecker at the top of a dead stub, in the Partial Clearing. Every night about sundown the Nuthatch would seek this shelter. Once, after it had retired for the night, a Downy Woodpecker came foraging for a morsel of dessert for its late supper, and clambered up the stub as it inspected the bark. It chanced to keep to the other side of the stub until it reached the top, when it sidled around and discovered the hole just below the top. The woodpecker moved to enter the cavity, but a movement from within warned it that the place was tenanted, and the Downy hastily fluttered around the stub to another position. Again the woodpecker circled the stub and looked into the hole, but again the tenant gave it a sharp reminder of its own claim, when the intruder withdrew and continued its untimely foraging elsewhere.

BROWN CREEPER. *Certhia familiaris americana* Bonap.

Length 5.6. Upper surface brown sprinkled with gray; tail plain and pointed; under parts white; *bill slender, curved*.

The Brown Creeper is an inhabitant of the mixed woods, preferring them in their more open aspect. Mature trees are essential to the Creeper and it constantly associates with the Downy Woodpecker, White-breasted Nuthatch and Chickadee. I first heard the song of the Creeper here. An adult was at work getting and carrying food for several young birds lately out of the nest. He gleaned chiefly from the trunks of maples and beeches, and as he climbed about he sang from time to time, usually only when well up toward the top of the trunk. The song was a weak but pleasing twitter or warble much like that of the Black and White Warbler,—a chattering expression of content distinctly different from any other song heard in the open woodland association. The date was July 22, long after the Brown Creeper is supposed to have concluded his

household cares. In the latter part of the summer the Brown Creeper utters a short clear whistle, a single note resembling the syllable *tseet*, framed by tongue and teeth. This note is enunciated oftenest as the Creeper travels up a tree trunk, and the whistle is given after the bird has enjoyed a dainty titbit. The nest is a bundle of soft stuff tucked in a crevice under loose bark, and the eggs are white with brown spots.

WINTER WREN. *Nannus hiemalis hiemalis* (Vieill.)

Length 4. Upper parts deep brown; wings and tail with dark bars; under parts light brown, barred with black and white; *line over eye tawny*.

The Winter Wren frequents not only the dark solitudes of the forest but more open spaces, frequently along the small watercourses that drain patches of bog or miniature ponds amid fallen trees, tangled shrubbery, mossy logs and boulders. A favorite nesting site is among the roots and earth upheaved by an overturned tree. One nest examined in such a situation on June 24 had young about ready to fly. Nesting dates for this wren vary considerably, as on July 31 two broods were seen in the dark virgin forest which apparently had just left the nest. It is interesting to watch these youngsters when disturbed. They scatter like young Bob-whites; some crouching in the sparse ground cover, while others may seek higher shelter. One was noticed clinging to the bare bark near the base of a large tree, like a growth on the bark, silent and watchful, seeking to avoid detection while the adults were scolding forcibly under cover near by and trying to draw the brood from the threatened danger.

HOUSE WREN. *Troglodytes ædon ædon* Vieill.

Length 5. Upper surface cinnamon-brown; faintly barred; under parts gray; *tail rather long*.

The House Wren is a bird especially of the Habitation Clearing and the borders of the campus, and has no association with bogs or real woods. It stuffs some hole in a dead stub, or a convenient crevice elsewhere, with twigs, in the midst of which is a soft little nest and six or eight red-peppered eggs. After the young leave the nest, the House Wrens resort to the shrubbery of burns and clearings, where they skulk under cover until they disappear late in the fall.

* BROWN THRASHER. *Toxostoma rufum* (Linn.)

Length 11.4. Upper surface rufous; below, white, spotted with black on breast, belly and sides to the angle of the mouth; bill long and curved.

This bird was not observed by me in the season of 1916 at Cranberry Lake. Merriam mentions the Brown Thrasher as occurring with the Catbird and the Wood Thrush about the western foothills and borders of the Adirondack region. Of these three species, the Catbird has become an established and regular resident at Cranberry Lake, but the others have not yet become noticeable.

CATBIRD. *Dumetella carolinensis* (Linn.)

Length 9. Slate-gray, with black head and tail; under tail-coverts chestnut.

The Catbird inhabits the Partial and Habitation Clearings and the bordering scrub about the campus. In the parts of the Burn nearest the Camp this species was much at home, especially in the season of ripe fruits and berries. The Catbird is an example of those species that extend their range under suitable inducements, for early accounts show that it was then confined to the borders of the wilderness, while now it is met with throughout the Adirondack plateau.

REDSTART. *Scotophaga ruticilla* (Linn.)

Length 5.4. Black; sides of breast, band in wings and on tail, rich salmon-red (yellow in female); lower parts white.

The Redstart has very little association with the virgin forest, but frequently dwells along the border of the bog forest where such vegetation meets a burn or clearing. It enjoys small swampy spots thickly grown with maple or willow or birch, perhaps with water under-foot, the whole open pretty well around but darkened within. In such retreats the Redstart hunts for its insect fare, and in an upright fork makes its nest of bark and hemp-like fibres and lays red-specked eggs.

CANADA WARBLER. *Wilsonia canadensis* (Linn.)

Length 5.5. Ash-gray above, forehead and crown blackish; below yellow, a broad band of black spots crossing the breast; no white on wings or tail.

This lively warbler haunts boggy and burnt clearings and the scrub along the verge of the deep forest where plentiful light penetrates the tangle and water is accessible. Ralph Hoffmann speaks of it as very inquisitive. "An intruder may frequently hear its alarm-note, *chick*, or catch a glimpse of the black 'necklace' across its yellow breast as it flies low in the bushes. Its song is a rather hurried outpouring of notes, introduced by the same *chick* which it uses as an alarm-note." Its nest is half hidden in a stream bank overhung with moss, or some similar fastness; and the eggs are white with reddish spots about the large end.

MARYLAND YELLOW-THROAT. *Geothlypis trichas trichas* (Linn.)

Length 5.2. Above, olive-green; forehead and cheeks black, bordered on the nape with gray (no black mask on the female); below, bright yellow becoming whitish toward the tail.

The Yellow-throat inhabits bushy openings wherever there is sufficient moisture to produce a grassy growth among the shrubbery. It chooses swampy depressions in the Burn, or the weedy margins of streams and shores of ponds and lakes. The Meadow is an especially favorite habitat here, for, while dry in the summer, it supports tall grasses, iris and small berry bushes, a combination well liked by this ground-creeping Warbler. Among the stout grass stems it can clamber and search for food; and after one of its fluttering, ecstatic

flight-songs it can drop down into a safe covert. The Yellow-throat's first choice is a regular cat-tail swamp in whose shrubby border it can find a convenient cluster of iris in which to hide its nest and red-spotted eggs.

MOURNING WARBLER. *Oporornis philadelphia* (Wils.)

Length 5.4. Head bluish slate-color; back and tail olive-green; throat blackish; breast black; lower part yellow; no white anywhere.

The Mourning Warbler is an inhabitant of the shrubbery of clearings usually dry. It likes a partly cleared knoll, where there are logs and stumps overhung by scattered clumps of bushes and saplings. There it sings low in the shrubbery, skulking just out of sight and uttering intermittently its loud, clear notes. The Mourning Warbler seems to live in a zone between the ground and the lower portions of the bush foliage, utilizing a plane of the clearing unappropriated by any other warbler. Toward evening the male will begin to make the round of the small area it frequents, singing as he halts here and there to pick up a bit of food, and slipping noiselessly and shyly from one station to another. Its nest is made on or near the ground and its eggs are spotted with reddish brown.

WATER-THRUSH. *Seiurus noveboracensis noveboracensis* (Gmel.)

Length 6. Upper parts dark brown, a buffy line over the eye; under surface buff, profusely spotted with black.

The Water-Thrush dwells near quiet pools or brooks where alders clog the shallow levels of the stream and where bushes fringe the margins. Here is heard its loud song, a series of *twits*-s in rising emphasis, and a series of *twee*-s in falling, a curve or arc of music rising with gradual elevation and then curving abruptly downward like a rocket shot outward at a low angle. The bird itself is not often seen, though it is inquisitive and frequently comes into view when its curiosity is aroused by the anxious chirping of another bird disturbed by the observer. Once this summer, when a Song Sparrow was chirping nervously at my presence near a land-locked pool of the brook, a Water-Thrush came out from its retreat under the overhanging shrubbery and perched in the base of the sapling clump where the sparrow was voicing its anxiety for the safety of its young hiding in the thicket. The Water-Thrush teetered on its perch and peered about the spot as if to determine the cause of the disturbance, almost within arm's length of me. On another occasion this summer, near the same quiet little pool, while I was hunting for the nest of a pair of White-throated Sparrows, which were loudly chirping around and overhead in the saplings, four pairs of warblers came and hopped about with the Sparrows,—Water-Thrushes, Myrtle Warblers and Magnolia Warblers,—all interested in the disturbance, apparently unafraid of the real cause of the confusion, and each uttering its characteristic chirps and calls. The Water-Thrush places its nest in some nook of an overhanging bank near the water, and lays white eggs, delicately speckled.

OVEN-BIRD. *Sciurus aurocapillus* (Linn.)

Length 6.2. Upper surface brown; *crown dull orange*, edged with black. lower parts white, black-spotted.

The Oven-bird frequents dry open woods, and it seems restricted to this habitat. The favorite woodland must be well matured, as for example, the forest on a dry knoll where lumbering was done in an early day so that the large deciduous trees were left tolerably intact, and second growth conifers are now mixed in small proportion. An undue amount of ground cover will cause the Oven-bird to look elsewhere, for it prefers places where it can walk about unhindered in hunting its food among the leaves and litter. It derives its name from the shape of its nest, which is made in a little niche on some wooded hillside and arched over by twigs and leaves, with an entrance at the side; thus reminding one of an old-fashioned outdoor oven. The eggs are white with red and brown spots.

BLACK-THROATED GREEN WARBLER. *Dendroica virens* (Gmel.)

Length 5. Back olive-green; *checks greenish yellow*; *throat and breast black*; under parts white, streaked with black; vest yellow; wing-bars and spots on tail white.

This warbler is associated with the coniferous species of the mixed woods, preferably in its more open aspects in the minor growth along the borders of a bog or the virgin forest. Mearns reports that "it is found everywhere, in all kinds of woods; but is especially numerous in hemlocks growing among deciduous trees." Hoffmann describes it as "the chief inhabitant of the white pines, where one hears continually its wheezy notes. It is also a common resident of the red cedar or savin groves of southern New England, and of the spruces of northern New England and New York."

* BLACKBURNIAN WARBLER. *Dendroica fusca* (Müll.)

Length 5.3. Back black streaked with gray; crown and line under eye black; *throat, breast and line over eye bright orange*; wide white wing-bar; lower parts yellow, streaked on the sides.

This gaudy warbler was not seen by me, but it has been frequently reported in neighboring counties and will no doubt be found some day at Cranberry Lake. Eaton speaks of it in the Adirondacks as "one of the characteristic woodland warblers, being practically as abundant in the depths of the forest as about the edges of clearings or along the streams." It nests and hunts and sings its thin, sharp warbling, high up in the evergreens.

BLACK-POLL WARBLER. *Dendroica striata* (Forst.)

Length 5.5. Back streaked gray; *crown black*; *checks and wing-bar white*; lower surface white, streaked on the sides.

The Black-poll seems to prefer the open bog forest where there is an association of young and medium-sized conifers in sphagnum ground, and of low bog shrubs in cleared spots and illuminated openings. This preference for small growth leads the Black-poll higher on the mountainsides than other warblers associated with coniferous forest.

CHESTNUT-SIDED WARBLER. *Dendroica pensylvanica* (Linn.)

Length 5. Back streaked; cap yellow, bordered at the eye with black; under surface white; *sides broadly splashed with chestnut-brown.*

The Chestnut-sided Warbler is associated with all kinds of clearings. It is one of the commonest birds of the Burn. If it can find berry bushes in which to nest, and saplings in which to forage and sing, it is immediately at home. It inhabits a zone or level in the scrub just above that of the Mourning Warblers, but nests in low shrubbery, commonly among the stems of raspberry and blackberry bushes at a foot or two from the ground. It lacks the fear and shyness of the other bush-dwelling warblers, and will carry on its activities regardless of the presence of an observer, much like a Chickadee. It scarcely ever gives forth any calls or notes of alarm when disturbed in feeding its young, but quietly continues its work as if accustomed to observation, singing contentedly as it works among saplings or the lower branches of trees. A representative song of this warbler sounds to me like *swée swée swée swée-swée-see-chew*, consisting of four or five uniform notes, followed by the short, hurried sentence of three notes, stressed on the second. The song is frequently only the introductory series of notes, like *see see see see see*, with the short closing sentence omitted; at other times merely the *seet see chew* is heard, strongly accented on the second note. Three forms of the song are thus recognizable. Singing continues while the father is feeding the young recently out of the nest; and usually after carrying a bit of food to a fledgling skulking in the shrubbery the male will fly to a convenient station and utter an abbreviated song before continuing his duties.

The Chestnut-sided Warbler leads a happy, homelike life for several weeks after the young leave the nest, the adults attending the juveniles with parental interest in the saplings near the nest. At this season the male sings a quiet little strain, a low murmured chatter or warble. When I first heard it I felt certain that a small Vireo, Bell's, as I had heard it in the Illinois berry thickets, was in the patch of alders. A family of this warbler will remain in the same clump of saplings for several days, if undisturbed.

The Chestnut-sided Warbler seems to be nearly altogether insectivorous. On one occasion this summer, however, I observed a male pick and eat two elderberries while gleaning leisurely among sapling foliage in which the berries were temptingly drooping; indeed, the bird's manner gave me the impression that it was eating the fruit more as an experiment than because of an established taste for the berries.

MAGNOLIA WARBLER. *Dendroica magnolia* (Wils.)

Length 5.1. *Head ash-gray; back and cheeks black; large patches of white on the wings and tail; tail broadly tipped with black; under parts yellow; breast and sides heavily streaked.*

The Magnolia, or Black and Yellow Warbler, is an inhabitant of the mixed woods where conifers predominate, preferably in the more open lighted areas. Its most favored habitat here was the

rather open bog forest. Conifers probably form the chief influence in determining the resorts of this bird, which follows the hemlock, spruces and balsam well up on the mountainsides. Benjamin Hoag ('94, p. 87) describes the nesting of the Magnolia Warbler at Stephentown, New York, as follows: "They had chosen for their summer home a woodland corner on the higher ground above a timbered swamp. Here in past years some of the timber had been cut, leaving little clearings among the tall pines, hemlocks, and deciduous trees, . . . and just across an old wood-road from one of these bush-grown clearings the nest was located. It was about six feet from the ground, on one of the lower limbs of a hemlock sapling, and was loosely constructed of fine hemlock twigs, weed-stems, and a few scraps of yellow-birch and wild-grape barks; lined with fine rootlets and horsehair."

MYRTLE WARBLER; YELLOW-RUMPED WARBLER. *Dendroica coronata* (Linn.)

Length 5.6. Upper parts mottled blue-gray; crown-patch and *rump* yellow; throat, wing-bars, tail-spots and belly white; breast black at the sides, heavily spotted below.

Sphagnum-carpeted localities, with scattered clumps of young spruces and firs and occasional deciduous trees, making the area about half open, are most favored by the Myrtle Warbler. It obtains its food mainly from spruces and fir, and nests in their lower branches, laying grayish white eggs spotted with brown. I did not find this warbler so plentiful at Cranberry Lake as is the Chestnut-sided, but the prevalence of clearings made the latter more noticeable than the former, as the Myrtle Warbler has little to do with clearings except where they meet the woods.

BLACK-THROATED BLUE WARBLER. *Dendroica caerulescens caerulescens* (Gmel.)

Length 5.2. Upper parts grayish blue; *white wing patch*; sides of head, throat, sides of breast and belly, black; otherwise, white below.

This Warbler prefers the typical mixed woodland in its dry open aspect. The preferences of this warbler in its Canadian summer home are described by Kells ('87, p. 76): "The favorite habitat of the Black-throated Blue Warbler is high, hardwood, timbered lands, where there is a thick growth of low underbrush, and while the males seek an elevated position among the leafy boughs for the display of their musical talents, the females usually select a lowly site for the cradle of their progeny." This characterization applies to the bird's habits here, as I encountered it in the Partial Clearing, and also in the dry open woods across Sucker Brook. Egbert Bagg ('87, p. 90) gives an interesting account of this warbler's habits near Holland Patent, in Oneida County. He describes the locality as high and dry ground, nearly, if not quite, surrounded by a swamp. "On this knoll, which was covered with large timber standing rather openly, but grown up thickly with brush from three to ten feet high, on the driest part where the brush was lowest, and

composed almost entirely of sugar maple, we found three of the four nests which rewarded our efforts." One of the nests was placed two feet from the ground in the upright fork of a little maple bush. Another nest was in the upright fork of a little maple nine inches from the ground. The third was only a foot from the ground. The nests were made of strips of rotten wood, held together and lined with fine black roots and a few strips of bark.

To me the usual song of this warbler sounds quite like the syllables *me gee h-e-e*, with the second syllable accented and the third somewhat lengthened or drawled. It may have other musical expressions, but this one song is definite and characteristic, and the one oftenest heard, as monotonous as the repetitions of the Red-eyed Vireo.

* YELLOW WARBLER; SUMMER WARBLER. *Dendroica aestiva aestiva* (Gmel.)

Length 5.1. *Everywhere yellow*, greenish on the mantle; breast inconspicuously streaked with fawn-color.

I did not see this warbler at Cranberry Lake, nor is it often seen in the forested parts of the mountains owing, in my opinion, to the absence of extensive willow growth in the plateau region. Swamps of *Salix*, or places where the willow grows in clusters in river valleys, are the situations that attract the Summer Yellowbirds.

* NORTHERN PARULA WARBLER. *Compsothlypis americana pusilla* (Wils.)

Length 4.7. Upper parts *grayish blue*; patch of yellow in the middle of the back; lower parts yellow, brownish on the breast and white near the tail; white wing-bars.

The Northern Parula Warbler is very closely associated with "the bearded pines and the hemlocks" wherever they are draped with tufts of the pale green *Usnea*. Very little of this lichen is found in the Cranberry Lake district; hence the Parula was not present. It should be found in Adirondack swamps wherever the *Usnea* occurs.

NASHVILLE WARBLER. *Vermivora ruficapilla ruficapilla* (Wils.)

Length 4.7. *Head ashy*; upper surface, light brown; lower, yellow.

Open bushy tracts in dry locations are probably the first choice of the Nashville Warbler, preferably with a trace of human surroundings, such as an abandoned mill site, neglected to grow up to berry bushes, pasture grasses, and sapling clumps. Any small tract of this character will invite this warbler, but it avoids the forest. It makes its nest on the ground.

BLACK AND WHITE WARBLER. *Mniotilta varia* (Linn.)

Length 5.3. *Striped*, black and white.

The Black and White Warbler lives in broken woodlands chiefly where the deciduous elements are pronounced, and probably occurs most frequently in medium-sized timber. Its habit of feeding is much like that of the Brown Creeper, for it travels up and down a

tree trunk or a stout branch in a creeper-like manner, searching the crevices of the bark for insects and their larvae or eggs. Its voice is thin and sharp. The nest is situated on the ground.

BLUE-HEADED VIREO. *Lanivireo solitarius solitarius* (Wils.)

Length 5.6. Head slaty; back lighter gray; wing-bars white and a white space about the eye; under parts white, brownish at the sides.

The Blue-headed Vireo inhabits woodlands. Its preference is for timber in the dry, open aspect, where the upper portions of ridges support an uncrowded growth of mature hardwoods with little underbrush; yet it frequently dwells in the sunlit margin of a bog forest, or of a burn.

***WARBLING VIREO.** *Vireosylva gilva gilva* (Vieill.)

Not seen by me. Eaton says that it undoubtedly breeds in every county of the State with the exception of the interior of the Catskill and Adirondack districts. The Warbling Vireo may be distinguished from the familiar Red-eyed, by its smaller size, yellowish ventral tinge, and lack of a dark line through the eye.

RED-EYED VIREO. *Vireosylva olivacea* (Linn.)

Length 6.2. Brownish above; crown gray, with a narrow black border; whitish line over eye; lower surface white.

The Red-eyed Vireo abounds in almost all aspects of the forest except dense bog woods. It lives in clearings where small trees have obtained a standing, in the borders of the Burn, and in open woodlands of every kind. It is one of the birds whose preferences for timber lead them into the virgin forest, but there they require a "margin" of some sort, usually a brook or a bog, which breaks the forest canopy in some degree. Though it nests most commonly in sapling growth it hunts and sings in the trees, preferably such as form spreading tops at medium height, but it has little to do with evergreens. At Barber Point a pair of Red-eyed Vireos nested about six feet from the ground in a drooping fork of a maple, amid blackberry and raspberry bushes; another pair had a similar nest in a small beech in the edge of the open woods; and a third was in a small maple in a bushy clearing, near the lakeshore. The nests of all the vireos are much alike,—cups of bark and spider-silk hung beneath a horizontal fork. The Red-eyed Vireo is a jealous watcher over the space about its nest, and it manifests an especial dislike for the presence of a Grackle in the trees near its home, scolding and trying to drive it away.

***MIGRANT SHRIKE.** *Lanius ludovicianus migrans* W. Palmer

No Shrike was seen at Cranberry Lake; but this species may be noted there in future, for Eaton finds that it is a fairly common breeder in western and central New York, in the Black River Valley, Mohawk Valley, and around the outskirts of the Adirondacks.

He also says ('14, p. 364) that it has gradually increased in numbers since the clearing of the country.

CEDAR WAXWING; CEDAR-BIRD. *Bombycilla cedrorum* Vieill.

Length 7.2. Head and throat snuff-brown, becoming grayish on back and breast; head crested; under parts yellowish; end of tail yellow; quills of wings and tail often tipped with red sealing-wax-like points.

The Cedar Waxwing frequents all aspects of the wooded regions except the virgin forest, but is usually attracted more by shrubbery than by large trees. It uses the tall trees principally as stations from which to sally out and capture flying insects, and in this it rivals the true flycatchers in ability. The Cedar-bird is noted for its taste for fruits and berries, and wherever it finds these in the woods, burns and clearings, there it establishes itself for the breeding season. This breadth of fare gives the Waxwing a wide range of habitat and in the Adirondack region it has merely to settle down in the midst of plenty.

It is a late breeder. A pair at Barber Point selected a site in a small beech on the campus, choosing a horizontal fork screened by foliage above and below. They began to construct the nest on the first day of July, both birds taking part in the work, the male accompanying the female in her trips for nest material. His share of the building operations was to carry the short slender twigs used in the framework of the nest, while the female brought the moss and lichens for its thick walls. The female did all the work in shaping up the walls and in weaving the twigs and moss together, and as she sat in the structure at this labor the male usually stood on the rim of the nest. On July 10 this nest was complete and on August 9 the young birds left it, measuring a period of forty days. Several other nests were made on the campus, and one was in an open part of the bog, on a horizontal branch of a small scraggy spruce. This nest was composed chiefly of moss or lichen, similar in construction to many that I had examined in Montana, and was the only nest of this species that I ever found in a spruce. One other nest of the Cedar Waxwing deserves mention, for it was in a willow sapling admirably concealed in a mixed clump of willow and aspen, and was a good illustration of the value of the aspen in the Burn association in its relation to the nesting habits of birds.

The Cedar Waxwings begin to make their appearance in the woods and clearings with the flowering of the berry bushes. They associate in small flocks at this time, and frequently a troop of them will be startled from a small area of blackberry bushes, where they have been eating the blossoms or embryo fruits. They feed eagerly on stamens and pistils of the blackberry blooms, and from this time they find the woods and berry patches a storehouse of wild-wood supplies. No bird of the Great North Woods has a keener appetite for wild fruits than the Cedar Waxwing, and it has in the Adirondacks an unlimited orchard of nature's choicest undomesticated berries.

ROUGH-WINGED SWALLOW. *Stelgidopteryx serripennis* (Aud.)

Length 5.7. Dark brown above; throat and breast *brownish gray*; belly white.

The Rough-winged Swallow occurs in small numbers in the western Adirondack region. A pair nested in an iron pipe at a boat-landing near Barber Point. Posson ('90, pp. 107-108) reports that in Orleans County it is a summer resident that may be depended upon, its favored nesting locations being crevices of the stonework under bridges. Occasionally a few will nest in a sandy bank with the Bank Swallows.

BANK SWALLOW. *Riparia riparia* (Linn.)

Length 5.2. Grayish brown above; white below; narrow, but distinct *brownish band across breast*.

The Bank Swallow occurs locally at Cranberry Lake. An open face of sand, steep, and fifteen feet or more in height, facing a piece of water, will attract this swallow to colonize, for it delights to hunt over still water and will also course low over a line of alders fringing a level rivulet, foraging for insects that rise from the stagnant pools. A small colony nested near the Point. The really "good times" in their experiences came when the young were getting a-wing, for those were the days when the juveniles were trained in all the arts of flight, insect catching, nest construction, self-support, and community life in general. I hold the view that with most birds the post-nesting period of the summer, particularly the time between leaving the nest and when the adults cease to manifest the parental instincts, is devoted to a more thorough training of the young than the birds are usually credited with; and that this accounts for the peculiar actions observable in the relations of adults and juvenile birds at that season. The flying young of the Bank Swallow are induced to stop in their evolutions and cling to the face of the bank containing their nests. My first thought was that the youngsters, tired of their circling over the water, were stopping to rest; but the elders were leaders in these movements, and I suspect the purpose was to start the juveniles at digging in the bank as a suggestion for the manner of nest construction another year. Another trick of the elders was to alight with the juveniles on bare open ground for the purpose of picking up fragments of light grass stems to carry away; as the season for nest building had passed, it seems that such actions were to initiate the youngsters into the art of nest building.

Allen ('03, p. 149) says: "This is the first of our swallows to leave, and among the White Mountain valleys the breeding colonies break up and disappear by the middle of July." This is much earlier than in the western Adirondacks, for the Bank Swallows at Barber Point remained at least until my observations ended about August 20, though the numbers were not so noticeable as when all the families were on the wing several weeks earlier. It appears that there is a gradual thinning out of the numbers by individuals join-

ing themselves to flocks gradually enlarging in the chosen roosting-places until the time for the autumnal departure southward.

TREE SWALLOW. *Iridoprocne bicolor* (Vieill.)

Length 6. Steel-blue or steel-green above; white below.

The Swallow is always associated with tall dead timber on the margins of lakes, ponds, or inlets, or in a burn. As it nests most frequently in woodpecker holes in dead stubs and snags, it finds many places inviting its presence throughout the Adirondacks. It may regularly be noted coursing over the clearings, burns and ponds, in its ceaseless quest for insects in company with the Chimney Swift or Bank Swallow, and sometimes gleans in the dooryard regardless of other occupants.

BARN SWALLOW. *Hirundo erythrogastra* Bodd.

Length 7. Above, blue-black; forehead and upper breast chestnut; belly paler; tail deeply forked.

The Barn Swallow chooses a combination of still water and pastureland over which it can quarter in persistent evolutions. These, and a building made for domestic animals, will influence it to establish itself locally for the summer. It was seen by me at Wanakena and at Cranberry Lake village but not at Barber Point, yet its distribution in the Adirondacks is very general. Its nests of mud, straw and feathers are always placed *inside* the barn chosen, and its elongated white eggs are marked with red about the larger end.

* CLIFF SWALLOW. *Petrochelidon lunifrons lunifrons* (Say)

The Cliff Swallow was not observed by me at Cranberry Lake in 1916. Merriam ('81, p. 229) reports that it "breeds at suitable localities in the Adirondacks." Roosevelt, Jr., and Minot ('77, p. 2) mention it as occurring near Malone. Eaton ('14, p. 345) says that "in New York it is known locally throughout the State, but in many sections where it was very common 40 years ago it has almost entirely disappeared. At the present time it seems to be commonest in the Catskill and Adirondack districts and other sparsely inhabited sections of the State." It much resembles the Barn Swallow, but has a reddish buff patch on the rump, and a *square-ended tail*. Its nests are the flask-shaped structures glued under the eaves on the *outside* of farm buildings, hence it is commonly called Eave Swallow.

SCARLET TANAGER. *Piranga erythromelas* Vieill.

Length 7.5. Male, scarlet, with black wings and tail; female and young olive-green, with brown wings and tail.

Where tall hardwoods stand in illuminated patches (the so-called hardwood ridges) or along the borders of timber broken by streams and shores, there the Scarlet Tanager sings in the leafy canopy and makes its summer home. It loves the sunlight, and can be seen most frequently in an open tree top, either uttering its nervous, impatient songs or its *chip-chuur* call to its mate. The singing of the Scarlet Tanager is so close an imitation of the Robin's that many persons

overlook the bird's presence. Its songs, however, are quite distinctive, being repeated more hurriedly and nervously than the Robin's, with a somewhat harsher quality, nor do they have the higher and lower modulations characterizing the Robin's songs, nor the squeaking interpolations. The Tanager travels over more ground than the Robin in its morning recitals, for the latter sits in one place and sings repeatedly; but the Tanager moves restlessly from one station to another and from one tree to another, often for a considerable distance. In the Barber Point neighborhood a pair of Scarlet Tanagers nested in the dry open woods on a ridge from which the conifers had been lumbered many years before. The site of the nest was a drooping horizontal branch in a large maple, on a fork about ten feet from the trunk and about twenty feet from the ground. The *chip-chuur* of the male was heard when he was at a considerable distance from the nest, and by slowly following his call as he finally went to the nest, I was enabled to discover his home. Both parents were feeding the nestlings.

* INDIGO-BIRD. *Passerina cyanea* (Linn.)

Length 5.4. Male deep blue, darker on head; female brown above, faintly streaked.

The Indigo-bird was not seen by me at Cranberry Lake in 1916. This species should become more common with the extension of the clearings, especially those with the agricultural or domestic associations, as it is one of the birds noticeably enlarging their range within the general limits of definite vegetation associations.

ROSE-BREADED GROSBEEK. *Zamelodia ludoviciana* (Linn.)

Length 8. Head, throat, back, wings and tail black; lower parts, rump and wing-bars white; under wing coverts and *breast rose-red*; female streaked brown above, whitish below, with a white line over eye.

The Rose-breasted Grosbeak dwells in clearings, preferably in the shrubbery and sapling growth about old mill sites, and on the borders of burns near streams. This species has little to do with mature woodlands, and berry patches are the most potent factor in its occurrence in the Adirondack Park, at least during the fruit season, for it is as eager in its attendance on these as are the Robin and the Catbird. At Barber Point this grosbeak nested in the Partial and Habitation Clearings, along with the Catbird and other birds of the bush. In the early spring it haunts the foliage of maple and beech, singing, hunting for insects, and eating the tender buds. After the song season, when the elders have charge of the juveniles on the wing, the sharp *chick* call of this Grosbeak will often be heard.

LINCOLN'S SPARROW. *Melospiza lincolni lincolni* (Aud.)

Length 5.7. Grayish brown streaked with black and chestnut; center of crown a gray stripe; *buff band across breast*; sides black-streaked, belly white.

A small colony of Lincoln's Sparrows inhabited the Bog, where perhaps four pairs were nesting, but it was not met with elsewhere.

This sparrow was active in the open parts of the Bog, where were only a few living trees, the most of the vegetation being small second-growth and heath shrubs springing from a sphagnum carpet. It was the strange outburst of song, uttered only occasionally, and usually when the male came from the nest and alighted in the lower branches of a larger tree, that aroused my attention to the fact that I had to deal with something not a Song Sparrow, and its identification quickly followed. Lincoln's Sparrow is much shyer and warier than the Song Sparrow, and keeps at a distance from observation; moreover, it utilizes the lower portions of the trees more than the Song Sparrow, and seems not to be a bird of the bushes nor of the shoreline shrubbery, as the Song Sparrow is, though its foraging for food is chiefly in low shrubs.

The singing of the Lincoln's Sparrow is very different from any of the Song Sparrow's performances. The general song consists of three parts or series of notes. At first it sounded like a strange warbler song; later I classed it as a wren-like performance introduced by several sparrow notes and ending with a jingle like a Meadowlark's or Towhee's. The three sets of movements will serve to distinguish the singing of Lincoln's Sparrow from that of the Song Sparrow or the White-throat when all these birds are inhabiting the same bog.

The actions and calls of these three sparrows when disturbed in nesting or feeding their young are also very distinctive and different. The White-throat and the Song Sparrow will chirp anxiously near the nest or at the disturber when danger threatens the nest or young, but the Lincoln's Sparrow will skulk silently and secretively in the neighborhood, making little outcry and furtively watching the course of events. The White-throated Sparrow utters a nervous *clink* marked by a metallic quality, and the Song Sparrow manifests its alarm by a scolding *tschick* in an explosive tone; but the Lincoln Sparrow hides behind a convenient clump of saplings and keeps quiet, leaving its young to do the squalling. Once this summer I chanced to be in the Bog when three fledglings of the Lincoln's Sparrow left the nest, and I was at once attracted to the spot by their harsh cries. No adults were visible when I reached the place, and the young squalled persistently as they perched low among the shrub stems waiting for the adults to visit them with food. It was in a spot where alders clustered, and the insect pests of the swamp hovered around me, but I determined to watch the proceedings for a while. For many minutes I waited, wiping off mosquitoes and "punkies" and other hungry minutiae, but during the time I heard nothing of the parent birds. Frequently one or another of the youngsters would slip out of my sight for a moment, and then I could hear a chirping of satisfaction from the young one not in view, and I knew one of the adults had slipped in and fed the bird without my noticing it. The three youngsters would scatter just enough to prevent my seeing them all at one time, and then in spite of my vigilance I would miss seeing the parent feed one or another of

them. I could determine by the actions of the young that a parent was near by, and the fledgling knew it somehow, though the old birds uttered no call or chirp. To all appearances the parents were ignoring the squalling babes, and during the hour that I permitted myself to be tortured by the bog pests they gave no sign of anxiety or alarm over the fate of their young.

At length I found a way to get a view of the adult, for, after feeding one of the brood, the parent would fly out of the thicket and alight low in a sapling or shrub at the outskirts of the covert where the young were hiding, stopping only momentarily and then hurrying away for a fresh morsel of food. The cry of the young Lincoln Sparrow is a loud chirp, not like that of any other sparrow in the region, and sounds more like the cry of a nestling Sapsucker. It seemed to care nothing about my proximity. Sometimes when its young are hiding in an open spot the adult will perch in view in the lower branches of a tree and utter a low *tchup*, quite different from that of the Song Sparrow; in most cases, though, the parent will lurk just out of sight of the observer.

SONG SPARROW. *Melospiza melodia melodia* (Wils.)

Length 6.2. Reddish brown and gray with black streaks; breast darkly streaked, with a *central cluster conspicuous*; head striped.

The Song Sparrow has a wide local range, including clearings of all kinds, the Burn, and the borders of the woods. It is particularly associated with shrubbery near still water. The dry Meadow, rankly overgrown with grass waist high and intermingled berry bushes, with a slow-running brook at one side fringed with alders was here its favorite habitat, and with the Yellow-throat, it fairly monopolized the area. The Song Sparrow nests freely near buildings and camps. Once this summer at Barber Point some young fir branches were cut and heaped back of a tent to be used for a sleeping bunk, but, being left unused, a nest of the Song Sparrow with three eggs was soon made in it, within arm's length of the tent. Another nest was in a tuft of grass at the base of a small blackberry bush, at the edge of the campus near the wharf.

SLATE-COLORED JUNCO; SNOWBIRD. *Junco hyemalis hyemalis* (Linn.)

Length 6.2. Head and back slate-gray; breast and sides somewhat lighter; belly and *outer tail-feathers* white.

The Slate-colored Junco is at home in all the woodland of the Adirondack region. A favorite location for its nest is among the root fibers of an overturned tree, and hence woods, as in a burn with occasional fallen trees, afford the Junco a desirable habitat. Another Junco haunt is a slope of terraced rock overgrown with moss and supporting a growth of spruce and fir, as is common in ravines.

The Junco is remarkably versatile in its adaptability to conditions, and understands the art of making itself at home in many varying circumstances. In the summer of 1916 a pair made a nest in the side

1

3

4, 5

2



Drawn by Edmund J. Sawyer

PLATE 33. BIRDS OF THE VIRGIN ADIRONDACK MIXED FOREST

1, Hermit Thrush.

2, Winter Wren.

3, Red-breasted Nuthatch.

4, 5, Golden-crowned Kinglet
(male and female).

of a slight mound of earth on the open campus at Barber Point, exposed to the eyes of persons in the tents not more than twenty feet away; and the male would forage industriously while his spouse sat in the little nest, and would glean near the back door of the cook-house as unconcernedly as the Chipping Sparrow or a Crossbill. Some mustard plants had made a squatter's claim near the kitchen, and the Junco frequently pecked at the mustard blooms. He would flutter up from the ground, pull at the flowers, and nip off portions of the stamens and pistils. While these Juncos were feeding their young in the nest, they pecked one morning at an old rain-soaked biscuit that had been thrown under a tree on the campus. A pair of Bronzed Grackles feeding young at the water's edge by the brook inlet also discovered the biscuit and recognized its value as ready-made food for their nestlings; and for a half day this product of the kitchen served as a center of activity for both Juncos and Grackles. There were four eggs in this Junco's nest; they hatched out on July 2, and on July 13 the young departed. It is worth while to note that one infertile egg was left in the nest, as happened in the case of a White-throated Sparrow's and also an Olive-backed Thrush's nest in the neighborhood.

* FIELD SPARROW. *Spizella pusilla pusilla* (Wils.)

The Field Sparrow was not seen at Cranberry Lake by me in the season of 1916, and according to Eaton is decidedly less common than the Chippy in the northern part of the state.

CHIPPING SPARROW. *Spizella passerina passerina* (Bech.)

Length 5.3. Streaked reddish and gray above; light-gray below; breast unspotted; cap reddish.

The Chipping Sparrow does not get far from human habitations. At Barber Point a pair lived in the Partial Clearing, and spent their time chiefly about the door of the cook-house and in the trees of the campus. The male of this pair had two favorite song stations, one on dead branches well up in one of the white birches, and the other on a dead branch of a large maple in the middle of the campus, about fifty yards away. He would sing from one of these stations for a while, then fly to the other for another recital; or perhaps he would sport about the Camp with the female, or glean for a time at the dooryard, and then seek one of these song stations for his musical performance. Another pair of Chipping Sparrows had a home in bushes in the meadow near the edge of the Burn.

WHITE-THROATED SPARROW. *Zonotrichia albicollis* (Gmel.)

Length 6.7. Brown-streaked above; gray, unspotted, below; throat brightly white; crown black, center a narrow white stripe, with a strong black stripe on each side, then a white stripe over and behind the eye; yellow spot before each eye.

The White-throated Sparrow is common in clearings of all kinds, especially in the Burn and the Bog. Kells ('89, p. 184), writing from the experience of a veteran collector, says: "The range of this

species is confined to tracts of low, swampy ground, or the margins of brush-littered woods, where there is an intermingling of low brushwood, creeping vines, tall grasses and fallen timber; but the half-burnt swamps are its peculiar home, from the early days of April until the advent of autumn; and here through all the summer-time its clear, loud whistling song is among the most conspicuous of all the bird melody that affects the otherwise unpleasant scenery." A bog or a burn are particularly desirable habitats for the White-throated Sparrow because of its fondness for berries. Judd ('01, p. 74) mentions some of the leading fruits sought for by the White-throat in summer, with the statement that "from July to November, inclusive, one-fourth of its food consists of berries." In the Adirondack plateau it eats such fruits as blueberry, wild cherry, mountain ash, sarsaparilla, elder, blackberry, dogwood and cranberry. Other kinds of food, however, are eaten by the White-throat. Once this summer I observed an adult of this sparrow while gathering food for its nestlings enter the open end of a decayed log lying obliquely on the sphagnum. As the sparrow already had quite a mouthful of insect larvae it had gathered from the moss, I pondered the reason for its entering the log. Upon inspecting the open cavity, however, after the bird had quickly emerged from the interior, I found a colony of large black ants just inside the opening, and I inferred that the Sparrow had added a nice juicy ant as a tidbit to the supply it was carrying home. On another occasion I surprised an adult White-throat foraging among aspens fringing the Burn, and it flew to a perch near me with a large green caterpillar in its mouth. On being disturbed unexpectedly, however, as it had not obtained a firm hold upon its victim, the latter dropped to the ground. The sparrow quickly flew down to recover its prize, but before it could get it, I had myself captured it as a specimen of White-throat diet.

This is one of the commonest of the breeding birds at Cranberry Lake, but is so artful in concealing its nest that to find the exact location frequently baffles the keenest observer. I have often hunted persistently for nests of this sparrow without success, and at other times chanced on a nest by mere accident. A nest of the White-throat at Barber Point was made in a low raspberry bush among enveloping low shrubs just beside a narrow trail used every day through the Habitation Clearing. The nest was not found until July 24, for it was at a place where a survey party had lopped off some saplings and thrown them beside the trail; under this partial screen the White-throats constructed their home in the bush, so carefully concealed and so quietly made that it was not discovered until the female was sitting closely on her eggs. As the date was rather late, and the nest complement in this case only three eggs, this was probably an instance of second nesting; moreover, one of the three eggs was infertile, and only two young left the nest. During the construction of this nest, and while the female was sitting, there was no indication by the singing of the male near by that a nest was at hand, for to my knowledge he never

sang nearer than fifty yards from the site. After the young came out of the nest the entire family disappeared. This nest was a bulky structure of coarse weed stems and joints of dried grasses, with fibrous rootlets interwoven, and a lining of fine rootlets and wiry grasses.

*SAVANNAH SPARROW. *Passerculus sandwichensis savanna* (Wils.)

The Savannah Sparrow was not observed at Cranberry Lake by me in the season of 1916, although Eaton ('14, p. 288) states that it is a "common summer resident throughout central and western New York and in the Adirondack district." It is distinguished by a bright yellow spot before the eye.

*VESPER SPARROW. *Poæcetes gramineus gramineus* (Gmel.)

The Vesper Sparrow was not observed at Cranberry Lake by me in 1916, but it was noted at Barber Point in 1915 by Prof. L. H. Pennington. Merriam ('81, p. 229) mentions it as common in "dry grass-covered clearings and sandy fields." Eaton ('14, p. 285) reports that "this sparrow is a common summer resident in all portions of the state." Its white outer tail-feathers, conspicuous in flight, are its mark of easy recognition.

*PINE SISKIN. *Spinus pinus* (Wils.)

The Pine Siskin was not seen by me. I fully expected to meet it in the western Adirondacks, for in the forest region of Montana the Pine Siskin associates so intimately with the American Crossbill that it seems peculiar to find the latter occurring commonly without the former. The supply of tamarack cones seems to be a leading factor in influencing their presence in the woods, together with the hemlock seed crop; and 1916 may have been a season which such attractions were lacking in the Adirondack bill-of-fare.

GOLDFINCH. *Astragalinus tristis tristis* (Linn.)

Length 5.1. Male, rich yellow, with black cap; wings and tail black, spotted with white; female olive-brown above, buffy below; wings and tail dusky.

The Goldfinch is a noticeable inhabitant of the Habitation Clearing and the Burn. It manifests a preference for human associations, and at Barber Point it came freely into the trees in the open campus, being attracted particularly by the seed-bearing white birches. During the later part of July and through August the Goldfinch resorted to the birches to feed upon the ripened seeds; often only a single pair frequented the birches, and early in the morning and at evening the male Goldfinch would perch in the top of a tall maple on the campus and utter his nuptial songs. Most commonly the Goldfinches are heard as they fly about the locality, usually in pairs, calling in plaintive tones their *dee ee* expressions of their emotions. Open low growth, with clumps of saplings and shrubbery, preferably with a trace of human surroundings, constitutes the favorite habitat

of this bird. The great natural cherry orchards of the moist burned tracts form an unlimited area where the Goldfinches roam in summer and rear their broods. A pair made a nest in a small birch sapling near a trail through the Habitation Clearing. The sapling was standing alone, and the site was a fork about five feet from the ground. During the construction of the nest the birds are quite noticeable by their *dee ee* calls; and the nest itself may usually be found by searching the saplings where they are heard calling during the breeding period. This nest was within twenty feet of an old stub containing a nest of a House Wren, and not far from a spot where a pair of White-throated Sparrows were nesting along the same trail. The pair of Goldfinches began work on their nest about July 14; the first egg was deposited on July 21, and on July 27 there were six eggs in the nest; the young were crowding the nest on August 18, and they left it soon after August 20.

WHITE-WINGED CROSSBILL. *Loxia leucoptera* Gmel.

Length 6. Male, rose-pink, middle of back black; two white wing-bars. Female, olive-green and dusky; rump and under surface yellowish.

A single specimen was seen in the open top of a tall tamarack in the Bog on July 27. Generally, where Common Crossbills are regularly found, the White-winged occurs with them in proportions of one of the latter to ten or twelve of the former.

COMMON CROSSBILL. *Loxia curvirostra minor* (Brehm)

Length 6.1. Red, mixed with greenish and yellow; female olive-green and yellowish.

This Crossbill was seen and heard every day, often only a pair or a group of four or five, and once a flock of twelve or fifteen. The seeds of the white birch appeared to be their principal food after the cones began to ripen. It seemed as if their visits to the campus in the early part of June was to inspect the condition of the birch seeds, and to determine whether there was to be an available supply. A pair would swing into the trees, utter their *quit-quit* calls and soon restlessly take flight for another neighborhood. Sometimes a small family, apparently two adults and two juveniles, would visit the trees, and this group was the most regularly noticed about the campus. Frequently they would scatter, and one or two of them would alight at the back door of the cook-house or in front of one of the tents, gleaning from the sweepings. As the birch seeds progressed to ripeness, the Crossbills would spend more time in the trees, generally feeding so quietly that their presence would be unobserved except as an occasional flutter of wings, or a low *quit* of satisfaction, would reveal their operations, as they feasted on the seeds. Later in the season the Crossbills were joined by a pair or two of Goldfinches and several Purple Finches, all feeding more or less in the birches. On the basis of the observations of these four white birches on the campus, I should estimate that at least one family of Crossbills in the neighborhood, one of Goldfinches and one of Purple Finches, were supported during the month from

July 20 to August 20 chiefly by the seeds of these birches. The Crossbills eat the seeds from the birch catkins in two different ways. Sometimes they cling to the terminal twigs where the cones are attached and bite out mouthfuls of seeds, often standing with head down in their endeavors to reach the catkins, and detaching seeds with their crossed, forcep-like mandibles, and many seeds fall wasted to the ground. Usually, however, they bite off the cones one at a time, holding each against a branch with their feet, and munch on it in a leisurely manner. The Crossbills are the only birds I have observed that have this habit of breaking off the catkins and holding them underfoot as they bite out mouthfuls of seeds. Mrs. Miller ('04, p. 8), however, mentions this action of these birds in their feeding, where she says: "The Crossbills were the most restless, as well as the most noisy of birds, appearing before my window a dozen times a day, sometimes staying but a few minutes, sometimes perhaps half an hour, biting off the cones, holding them under one foot and extracting the seeds in eager haste."

The Crossbills build their nests in evergreens, making a substantial structure of cedar bark, dried grass, and stems of the Norway spruce, lined with horsehair, feathers, dried grass and fibrous roots.

PURPLE FINCH. *Carpodacus purpureus purpureus* (Gmel.)

Length 6.2. Dull rose-red, brightest about the head; back brownish; belly white. Female grayish brown, streaked below.

The Purple Finch is a frequenter of the forest margins of the Bog and the clearings. It does not appear to get into the dense woods nor among the lumbered timber of the ridges. It also favors the minor growth near the water margins of the lumbered localities, and the Habitation Clearing is one of its preferred habitats. It is a restless creature, like the Crossbill, except when feeding, and scarcely gets well alighted before it is up and away again. The song of this finch resembles that of the Warbling Vireo, though the former's efforts are uttered singly and with such frequent change of station that no mistake is likely to be made. The Purple Finch frequently came about the dooryard or the space near the tents, but was shyer than the Crossbill. It associates occasionally with the Crossbills and Goldfinches in feeding on the seeds of the white birch.

BRONZED GRACKLE. *Quiscalus quiscula cneus* Ridgw.

Length 12. Head purple or steel-green or steel-blue; back and belly bronze; no iridescent bars.

The Bronzed Grackle is generally associated with the Camp or the Habitation Clearing, for it likes to frequent the trees of a dooryard, though in the western Adirondack region it nests most frequently in the cavities of broken dead snags. Cranberry Lake is noted for its extended inlets, along whose shores stand dead stubs and snags; and the Crow Blackbird makes such places its resort, especially if there are buildings in the vicinity. As soon as its young are on the wing the Grackle forsakes its nesting place and allies itself with other blackbirds flocking together in the swamps preparatory to their early departure for the autumn grainfields.

Concerning the small numbers of Bronzed Grackles in the Adirondack plateau, it must be kept in mind that there is little cultivated land. Herein I find perhaps the most powerful influence operating to restrict the relative representation of this Grackle. The scarcity of snails along the Adirondack lakeshores and streambanks is also worth consideration. Where a water-line abounds in snails, the Grackle tenants the neighborhood to a greater degree than where this food element is lacking. I have frequently watched a Grackle in central Illinois search from fifty to a hundred feet of riverbank until it found a snail in suitable condition at the water's edge, and then fly away with it across a mile of water to feed its young in the nest on the opposite bank, making such trips many times in the day. The literature to which I have had access does not emphasize mollusks as Grackles' food. Beal ('00, p. 63) does not show that snails constitute more than a small percentage of the Grackle's food. I am certain that nestlings of the Bronzed Grackle in the bottom-lands of the Illinois River are fed liberally on such common snails as are washed ashore at the water-level.

RUSTY BLACKBIRD. *Euphagus carolinus* (Müll.)

Length 9.5. Greenish black, the feathers sometimes with rusty edgings. Female, slaty-gray.

The Rusty Blackbird inhabits the low bushes with the alders in or along the borders of the grassy Meadow, where the few tall dead snags furnish them with convenient stations or lookouts. The Rusty Blackbird looks much like the Red-winged Blackbird minus the red markings of the shoulders. Moreover, its customary call of *cong ree* is much like the effort of the Red-wing, though, as uttered by the Rusty Blackbird, the call is more nearly in two parts than in three, like the Red-wing's. This species forages largely in the bases of the alders, getting a desirable food supply from the insect life of the stagnant shallow water in which the alders stand. In its association with arborescent shrubs and low bushes, the Rusty Blackbird is somewhat different from the Red-wing, as the latter resorts more to the grass of the swamp in its foraging.

* BALTIMORE ORIOLE. *Icterus galbula* (Linn.)

The Baltimore Oriole was not seen at Cranberry Lake by me in 1916. Eaton ('14, p. 237) says: "It is a common summer resident of all New York State with the exception of the wooded portions of the Catskills and Adirondacks, but enters the river valleys and cleared lands of the Adirondacks."

RED-WINGED BLACKBIRD. *Agelaius phoeniceus phoeniceus* (Linn.)

Length 9.5. Male black; upper part of wing broadly scarlet edged with yellow and white. Female brown and streaked.

The Red-winged Blackbird was observed by me at Cranberry Lake in only one habitat, the floating bog islands. These are common in various inlets, usually near the shore. They consist of submerged sphagnum as a foundation for a mat of mixed bog shrubs so inter-

mingled as to form a support strong enough to hold up a man in walking over it, though the whole mass will float when driven by a strong wind. Frequently a colony of Red-wings of considerable size would be associated with one of these islands.

* COWBIRD. *Molothrus ater ater* (Bodd.)

The Cowbird was not seen at Cranberry Lake in 1916. Eaton ('14, pp. 225-226) says of it: "It is altogether too common a summer resident in all portions of the State up to the beginning of the Canadian zone, but it also invades the valleys and cleared lands of the Adirondacks to the farthest edge of the Alleghanian area in that district."

CROW. *Corvus brachyrhynchos brachyrhynchos* Brehm

At Cranberry Lake I never heard the Crow except along Sucker Brook or near one of the inlets opening into the lake, and never more than one was seen or heard at any observation, the individuals seeming to live a solitary life.

* NORTHERN RAVEN. *Corvus corax principalis* Ridgw.

I did not see a Raven. Eaton ('14, p. 212) states that "at the present time a few may be seen in the western Adirondack region, especially in the northern portions of Hamilton and Herkimer counties, the southern portion of St. Lawrence County and the eastern portion of Lewis county."

* CANADA JAY. *Perisoreus canadensis canadensis* (Linn.)

The Canada Jay was not observed at Cranberry Lake by me in 1916. Roosevelt and Minot ('77, p. 3) report it as "locally common in the thicker woods." Eaton ('14, p. 210) says that it "is confined to the Adirondack district and is scarcely if ever, seen outside the spruce and balsam belt."

BLUE JAY. *Cyanocitta cristata cristata* (Linn.)

Length 11.7. Crested; above gray-blue; lower surface grayish and white; corners of tail white.

The Blue Jay frequents the margins of the forest along the stream valleys, preferably where a brook skirts an ancient stream bed so that the level stretches make an open margin in the thick woods. The Blue Jay also resorts to any burn, if there are scattered or separate trees of medium size, the beech being favored as a producer of nuts; and it also patronizes the open portions of the Bog, using the tall tree remnants as lookouts for its foraging excursions. Blue Jays ordinarily associate in little parties of two or three, after the young are on the wing, or perhaps an entire family will forage together. One will perhaps fly ahead, and then another may presently follow over the same line of flight, usually keeping above the forest in flying from one station to another. Once this summer I saw a troop of ten cross the bog in this way, one at a time, all keeping in the same general direction, and each calling loudly and stopping in about the same place in the woods where the leader had stopped.

According to Forbush ('13, p. 369): "The well-known Blue Jay (*Cyanocitta cristata*) is destructive to the eggs of the smaller birds, whose nests it robs systematically, and it has frequently been seen to kill the young. The Robin and other larger birds will drive the Jay away from their nests, but it often succeeds in robbing them by stealth. Vireos, warblers, and sparrows it regards very little, and plunders their nests without noticing their agonized cries. Jays and Crows together sometimes make it very difficult for other birds to raise any young."

PRAIRIE HORNED LARK. *Otocoris alpestris praticola* Hensh.

Length 7.7. Above brownish, streaked; throat and sides of head yellow; broad stripe from bill down sides of throat and the breast black; *black feathers over each eye prolonged into little "horns"*; lower surface white.

The Prairie Horned Lark was seen at Cranberry Lake by me in 1916, on only one occasion, when a pair visited the bare tennis court of the open campus on the morning of July 25, and pecked over the sandy area. When disturbed, they arose in the well-known mounting flight peculiar to the larks, rising by stages until above the trees near by and thence flying across the lake toward the north. Prof. L. H. Pennington includes this variety of the Horned Lark in his manuscript list of birds of Cranberry Lake.

LEAST FLYCATCHER. *Empidonax minimus* (W. M. & S. F. Baird)

Length 5.4. Above brownish green; wing-bars light buff; below white, grayish on breast, sides tinged with yellow; *tail slightly forked*.

The Least Flycatcher inhabits the clearings and avoids the real woods. It likes the sapling growth, especially of maple and birch, in the Burn, where it sets its nest in an upright crotch and whence it can dash out over the shrubbery and snap up hovering insects. This Flycatcher goes by the name of "Chebec" in many books, copied from its call, which is represented as accented on the second syllable. To my ear the call seems always accented on the *first* syllable, sounding somewhat like *see-zick*; and I cannot write it otherwise. G. M. Allen ('03, p. 122) remarks that "it seems to follow civilization almost as closely as the Alder Flycatcher does the alder swamps, and extends its range up the valleys with the settlements;" and adds, concerning the Chipping Sparrow: "Like the Least Flycatcher, it follows closely the path of civilization, and has doubtless greatly extended its range within historic times as the forests have disappeared before the advance of the white man." In another paper Allen makes a broad generalization as follows: "The effect of clearing off the heavy primeval forest by man in his progress up these same valleys has doubtless been to extend in great measure the transition area."

ALDER FLYCATCHER. *Empidonax trailli alnorum* Brewst.

Length 6.1. Like Least Flycatcher, but larger, and *no forking tail*.

The Alder Flycatcher is associated with well-lighted deciduous woods with a fair undergrowth of saplings and shrubbery. It

requires the minor growth, for its persistent dashes for insects are made in the spaces between the sapling clumps.

This flycatcher is usually described as retiring in its habits, but wherever I have found it in the breeding season it has impressed me as more demonstrative and aggressive than most of the other birds nesting in the same habitat. It manifests its most obvious trait as a flycatcher in its relations with its neighbors, for it is jealous of any birds that forage in the part of the ravine or thicket it frequents, and will snap vigorously at any Chestnut-sided Warbler or smaller bird happening to hunt in saplings where it is momentarily working. These exhibitions of rudeness are not because of the nearness of the intruder to its nest, for I have witnessed this flycatcher snapping at a warbler or vireo when the latter was at a considerable distance from the flycatcher's home.

In another characteristic not generally known this flycatcher is singular, for it has two styles of nest location, and frequently evades detection of its nest because the observer seeks in the better-known situations. It commonly finds a site in an upright crotch of a bush or sapling, but in some instances it saddles its nest on a horizontal branch from twenty to thirty feet from the ground. As a rule, if it selects a site in a bush or sapling, the nest is made in an upright crotch; but if a tree is chosen as the situation, the nest is saddled on one of the horizontal branches rather high from the ground but low in the branching portion of the tree. I have found more nests of the Alder Flycatcher in the middle story of the woods than in the bush-sapling zone, somewhat like the nesting locations of the Acadian Flycatcher. In another respect the Alder Flycatcher differs from the Least Flycatcher and the Wood Pewee, with both of which it associates to some extent; it leaves its breeding habitat soon after the young become self-supporting, and in the Adirondack region it is not noticed in voice or movements much later than the end of July, whereas the other flycatchers mentioned continue their activities in the neighborhood until late in August at least.

Eaton ('14, p. 197), in writing of the Alder Flycatcher, says that it is like the Green-crested or Acadian Flycatcher in that it usually keeps out of sight among the foliage. This is different from my own observations of the Alder Flycatcher, for it really seldom gets into the foliage, though its movements are generally screened by foliage between it and the observer. It follows the larger flycatchers in its habit of alighting on dead branches or bare portions of the minor growth as it forages restlessly in and out among the clumps of shrubbery in the ravine or area of bush it frequents, and most of its activities are thus carried on in the open spaces in its resorts.

The song calls of the Alder Flycatcher have received a variety of representations by different observers. J. A. Farley observes that its song consists of but one harsh explosive syllable. Allen ('02, p. 84) gives a rendition of three syllables, *wee-see-up*, with the second syllable accented and the *up* ending very faintly. Fol-

lowing the opinions of the foregoing observers, Mrs. Olive Thorne Miller ('02, p. 289) offers the following description: "The ordinary song, as I know it, consists of two notes much like the Chébec's. It is in the hoarse tone of the Phœbe, and is jerked out with a backward jerk of the head, after the manner of the Least Flycatcher, and to my ear, it sounds like *red-dy* sometimes — but not by any means generally." I am glad that Mrs. Miller suggests this representation of the call, for it appears that she recognizes the accentuation on the first syllable of the song, which to my ear, is very distinct, as in the case of the Least Flycatcher. Toward the latter part of the summer season, the Alder Flycatcher frequently expresses the exuberance of its emotions in a hurried chattering, apparently a running together of several of its customary song notes and calls, the performance constituting an attempt at musical production more ambitious than the flycatchers are usually supposed to undertake. At any rate the Alder Flycatcher, as it seeks food among the saplings, almost constantly utters its cry, resembling the syllables *cri ik* enunciated emphatically and impatiently; and in visiting its nest with food for its young, it is noisy and energetic in its chattering and scolding, like the large Flycatchers at their nests.

YELLOW-BELLIED FLYCATCHER. *Empidonax flaviventris* (W. M. & S. F. Baird)

Length 5.6. Above, *bright* olive-green; below, greenish yellow, brighter on the belly.

The Yellow-bellied Flycatcher was found at Cranberry Lake inhabiting a secluded portion of the Bog forest within a few steps of the margin where it opened upon the Burn. It was where the drainage was somewhat interrupted, causing a more prolific spot of second growth clustered with alders, and with one particular little nook of open *Sphagnum* enclosed by the typical vegetation. From that little nook in the Bog forest the dreamy call of this flycatcher lured me into its dull retreat where it was feeding its young recently from the nest as the fledglings lurked among the shaded alders. The call notes of this flycatcher consist of two syllables accented on the second, resembling the combination *puh-cc*, the second portion somewhat prolonged. It is a sweet, plaintive call, one of the sounds that make the Bog worth while, even in the face of the horde of insect pests that tormented me while I peered and ogled in my attempts to study the activities of this interesting hermit.

WOOD PEWEE. *Myiochanes virens* (Linn.)

Length 6.5. Above, dark olive, crown blackish; below dusky; throat white, belly yellowish.

The Wood Pewee inhabits the Partial Clearing and the dry open woods. For this species there should be broken woodland, with scattered mature trees, preferably hardwoods, though it does not avoid a lookout station on dead branches of a conifer. In its

chosen habitat its voice is one of the last heard in midsummer, and until late in August the plaintive calling of the Wood Pewee and the songs of the Red-eyed Vireo are the only kinds of bird music to break the monotony of the forest stillness. Like the Alder Flycatcher, the Wood Pewee, in the latter end of the breeding season, sometimes expresses its emotions in a chattering jumble of its regular song notes and calls, a performance akin to a flight song. Its nest is a cup of soft materials, set on a tree branch and covered with lichens like that of the scarcely less tiny home of the Hummingbird; and the eggs are white with a ring of spots about the larger end.

OLIVE-SIDED FLYCATCHER. *Nuttallornis borealis* (Swains.)

Length 7.4. Dark olive-gray and brown above; under parts dusky on sides, with a whitish stripe down the middle; no wing-bars.

The Olive-sided Flycatcher is one of the characteristic birds of the western Adirondack plateau, inhabiting the borders of the Virgin Forest along burns and clearings. Its lookout stations are tall dead stubs and spires in clearings near living coniferous timber, and on the top of one of these stations it perches and calls querulously, making frequent sallies into the air in pursuit of flying insects, and then returning to its station or to another similar lookout. Its loud calls are a familiar sound along the forest margins. To my mind the usual call resembles the syllables *grcc deal* accented on the second; frequently there are three syllables in the call, suggesting the combination *quip grcc deal*, accented on the last note of the phrase. A very frequent call of this Flycatcher contains only the *quip quip* repeated in pairs, and this constitutes the usual scolding note. Its nest is usually situated in the upper branches of a medium sized fir in the edge of the forest.

*PHŒBE. *Sayornis phæbe* (Lath.)

The Phœbe was not seen at Cranberry Lake by me, but is given in Dr. L. H. Pennington's MS. list. Eaton ('14, p. 187) says that it is probably the commonest member of the Flycatcher family, being a summer resident throughout the State except in the spruce and balsam forests of the Catskills and Adirondacks.

CRESTED FLYCATCHER. *Myiarchus crinitus* (Linn.)

Length 9. Head dark brown, somewhat crested; back olive-brown; tail reddish; throat and breast ashy; belly clear yellow.

The Crested Flycatcher was found in only one habitat at Cranberry Lake, the Lumbered Clearing near the lakeshore. The family wandered widely, however, after the young were on the wing, always in open localities and generally utilizing the Burn and the cleared margins of the higher woods. Wherever it is, the Crested Flycatcher manifests its presence by its harsh cries, for, like the Kingbird, it is noisy at all times and jealous of any unwarranted intrusion of its foraging area. Only one pair of Crested Flycatchers lived in the Barber Point neighborhood, and they had

a nest in a natural cavity of a large dead maple, the site being almost over a trail through the clearing. It is interesting to note that as soon as the young could fly, the family left that particular locality, patronized the Burn more freely and went ranging throughout the open areas where tall denuded trees gave them vantage points in foraging over the clearings. Regarding the limited numbers of this flycatcher in a neighborhood, it may be suggested that their noisy habits and wide range of feeding in late summer would make them seem abundant though only one family were living there.

KINGBIRD. *Tyrannus tyrannus* (Linn.)

Length 8.5. Back gray; head blackish; the crown with a concealed spot of orange; tail black, *tipped with white*; under parts white.

The Kingbird chooses the human or domestic element for its associations, preferably near the lakeshore or a cleared inlet. It nests most frequently in the margin of an inlet, sometimes selecting a low stump surrounded by water and building its nest on the top of it; and in its guardianship of the locality the Kingbird prefers scattered trees of medium or smaller size, or else isolated clumps of trees beyond the sapling stages, from which it can keep an eye on the surroundings and sally out in jealous defense of the premises. After the young are on the wing the Kingbirds become more noisy and loquacious than before, holding many loud and demonstrative conversations with the young in the course of their training for efficient kingbird life. It appears that if there are four young, the elders will divide their charge so that one parent assumes the task of training one or two of the juveniles, and the other parent takes care of the others; and for several weeks the education of the youngsters goes on and the adult keeps in company with the juveniles, feeding them regularly and initiating them into the arts of insect catching and food selection. It appears further that the two divisions of the kingbird family resort to localities quite separated for these post-nesting activities; and further, that these two selected localities are each favorable for a home for the young another season; hence it has seemed to me that a part of all this care on the part of the adults for the young is to acquaint the juveniles with suitable nesting localities for the next season.

An interesting example of this came under my observation. A pair of Kingbirds with two young appeared on a small island in the inlet at the mouth of Sucker Brook after the nest had served its purpose. No Kingbirds had been observed there previously, except casually, but this group seemed to make the place their established headquarters for giving their young a start in life. The island was peculiar in one respect,—it was a compact exhibit of the entire vegetation of the region, a small reproduction in second growth of the typical Adirondack mixed forest. It was much used by passing birds and made a desirable lookout for foraging operations. For two or three weeks these Kingbirds lived as above described, the elders attending the young and the juveniles lazily receiving the attentions of the zealous parents, practically confining

their activities to the locality. I believe that the elders were acquainting the juveniles with the locality in order that the latter might have an available nesting place another season.

RUBY-THROATED HUMMINGBIRD. *Archilochus colubris* (Linn.)

The Ruby-throated Hummingbird is associated with almost every aspect of the forest except the primeval woods. It darts among the shrubbery of the clearings everywhere, attracted by the blossoms of the various fruit and berry shrubs and bushes. In the Partial Clearing there was a place high up on an old birch where the Yellow-bellied Sapsuckers were resorting daily for sips of sap. A pair of Hummingbirds frequented the spot, and at almost any hour of the day one or another of these hummers, or both of them, could be noted either hovering at the holes or else perched on a dead twig near at hand waiting for another taste of the contents of the sap-cups. One or more of the Sapsuckers was certain to be clinging at the most productive holes, and in that case the Hummingbird would hover at places on the other side of the tree. I never observed that the Sapsuckers made any demonstration against the Hummingbirds, though when one of the latter would dart in and find the Sapsuckers there the Hummingbird would usually withdraw and perch near by to wait for the woodpecker to shift its position at the sap holes.

Insects also, probably small flies and bees, were flying around the perforations, but neither the Hummingbird nor the Sapsuckers seemed to pay any attention to them. It was evident that the sap was the chief desideratum with these bird visitors; and usually, after taking a sip from the holes, the Hummingbird would fly away in a well defined direction through the open woods, as if to visit a nest not far off.

CHIMNEY SWIFT. *Chactura pelagica* (Linn.)

The Chimney Swift belongs to an open habitat, mainly over the land. Like the Bank Swallow the Chimney Swift seems to devote considerable attention to training its young for its aerial evolutions. Once, as they were coursing over the Burn with their young on the wing, the elders were observed to swerve into the top of a tall dead tree and touch a terminal dry twig with their feet. At first I wondered at this action, as the nest-building season was past, and the birds could have no need of the twigs. As they repeated these feats, however, it appeared to me that they were seeking to induce the juveniles to attempt the same thing, and I concluded that I was witnessing a lesson in twig gathering as a preparation for the next season's nest building.

* NIGHTHAWK. *Chordeiles virginianus virginianus* (Gmel.)

The Nighthawk was not observed at Cranberry Lake by me in 1916, but Eaton ('14, p. 167) states that it "is found in every county of the State as a summer resident, but is somewhat local in its breeding."

* WHIP-POOR-WILL. *Antrostomus vociferus vociferus* (Wils.)

The Whip-poor-will was not seen, but Eaton ('14, p. 164) says of it: "In the Adirondacks it is confined mostly to the edges of the wilderness and is not found in the depths of the spruce forests, but invades the river valleys and clearings."

NORTHERN FLICKER. *Colaptes auratus luteus* Bangs

The Flicker is commonly associated with all aspects of the forest except the dense woods. It is met with in the clearings and the Burn, along the water margins of the forest, and the open portions of the Bog. The Flicker requires principally dead timber in the form of stubs, stumps and prone logs to forage on, and large, living deciduous trees, where it can frolic with its mates. Furthermore, the Flicker needs comparatively open localities of burn or clearing where it can reach the ground in its quest for ants, for it spends much of its time searching in the humus and rotting logs for ant colonies. A considerable part of the tearing open of rotten stumps in the woods is done by Flickers. Gaige ('14, p. 82) notes that during the blueberry season the birds were flushed in numbers from the ground among the bushes, and later haunted the wild cherry trees in the same fashion. "Both fruits were favorites and the birds stayed in their vicinity until after the fruits were gone."

RED-HEADED WOODPECKER. *Melanerpes erythrocephalus* (Linn.)

Not seen at Cranberry Lake by me in 1916, but has been reported in both the western and the eastern borders of the Adirondack plateau. This woodpecker is closely associated with oaks, and hence there is little to attract it into the Adirondack mixed forest except the beech nuts, which constitute an element of its food in the lower valleys.

NORTHERN PILEATED WOODPECKER. *Phloxotomus pileatus abieticola* (Bangs)

Length 17. Black; throat, two stripes on side of head, one on neck, and wing-bar, white; top of head *crested and bright scarlet*.

The northern variety of the Pileated Woodpecker, or Logcock, was observed occasionally in dry open woods and evidences of its work were seen in the large excavations made in dead stumps. In the heavy woods where lumbering had been done in an early day and the area left to recuperate, forming a mixture of mature deciduous trees and conifers left at the early cutting, the Logcock was frequently heard, but its numbers have lessened as its original range has been invaded by the lumberman. Hoffmann ('04, p. 219) aptly characterizes the Pileated Woodpecker when he says: "It is a mighty hewer of wood, leaving signs of its activity in nearly every decaying tree and on many sound ones in its neighborhood. Where it digs for grubs, it cuts out great rectangular mortise-like holes, different from the round nesting holes of woodpeckers in general. These holes often run deep into the tree, or run into each other up and down the trunk. The noise of its hammering resounds through the woods like the blows of a woodman's axe."

YELLOW-BELLIED SAPSUCKER. *Sphyrapicus varius varius* (Linn.)

Length 8.5. Crown and throat crimson; white loop from eye cross nape to other eye; broad white stripe from bill to white under-surface; above, black and white.

The Sapsucker lives everywhere except in the denser forest, making a nest in a convenient stub, loafing at its birch sap holes and training its offspring to lead the same life of lazy satisfaction. This Sapsucker enjoys such a variety of habitats because it finds everywhere throughout the major habitat the trees which furnish it with sap and cambium. In the Burn and clearings it finds the aspen saplings which it can tap in midsummer; in open woods it has plenty of adult birches from which it can select enough for a sap-orchard; and along the streams and shores there are hemlocks in abundance upon which it can operate. A detailed account of its sap-sucking habits has already been given (see page 420).

* AMERICAN THREE-TOED WOODPECKER. *Picoides americanus americanus* Brehm

Not observed at Cranberry Lake. Eaton ('14, p. 147) says that its range is evidently confined to the Adirondack forests, it being quite uniformly distributed within the spruce and balsam forests, but less common than the Arctic Three-toed Woodpecker. It is quickly distinguishable from the Arctic by the ladder-like arrangement of white bars across the back.

ARCTIC THREE-TOED WOODPECKER. *Picoides arcticus* (Swains.)

Length 9.5. Back wholly black; top of head black, with yellow crown patch and white stripe on the side; outer tail-feathers white.

The Arctic Three-toed Woodpecker was met with in the margin between the Bog and the Virgin Forest. It is one of the shy, wary creatures of the woodland, ceasing its loud tapping when an observer approaches and clinging quietly in its place until the disturber passes. A favorite position for it in working is on the under side of an oblique stub or spire, and it generally operates on the lower half of a tree trunk. Experts testify that three-fourths of its food consists of "the direst enemies of the forest trees."

DOWNY WOODPECKER. *Dryobates pubescens medianus* (Swains.)

Length 6.8. Upper parts black; lower white; back of head scarlet in male, not in female; middle of back and wing-bars white; outer tail-quills white, barred with black.

The Downy Woodpecker frequents the clearings of every kind, but is seldom seen in the virgin forest. It gleans from aspen, birch and maple saplings; it hunts along the trunk of the smaller hemlocks and hardwood trees; or it may alight on the sturdy trunk of the largest maple, beech or birch, and pursue its investigations into the topmost branches. Occasionally a small dead stub will serve all the purposes of the Downy, and it will peck industriously for a considerable time at one promising spot until it has unearthed the object of its search. The Downy Woodpecker is very kindly disposed toward human association, and will come into a dooryard in its foraging, manifesting no fear under observation.

HAIRY WOODPECKER. *Dryobates villosus villosus* (Linn.)

Length 9.4. Larger than the Downy, and outer tail-quills *pure white*.

The Hairy Woodpecker is rather more restricted in its habitat range than the Downy, and probably is slightly less in numbers, for it is not seen quite so often. It inhabits clearings, burns and dry open woods, the margins of the Bog being apparently its most favored habitat. Like the Downy, the Hairy swings into the campus and takes a hurried inspection of a tree trunk, then it swings away to another station, its loud clear call announcing its presence. It always works nervously and impatiently.

BELTED KINGFISHER. *Ceryle alcyon alcyon* (Linn.)

Length 13. Blue and white; crested; a gray band across breast. The female has a chestnut band across belly and sides.

The Kingfisher is a frequenter of lakes and ponds wherever there are small fish for its food and suitably steep shores of sand or dirt in which it can nest. Along the brooks, also, where there are quiet pools containing small fry and convenient perching sites, the Kingfisher establishes a summer home. As a rule the pairs of Kingfishers are well distributed, for one family requires a considerable distance of shoreline for its foraging, and an adult often flies quite a distance along a water margin in making desirable captures. It is a noisy fisherman, and its loud cries are uttered most commonly after it has made a dive and flies to another station.

* GREAT HORNED OWL. *Bubo virginianus virginianus* (Gmel.)

The Great Horned Owl was not seen by me at Cranberry Lake, but it was frequently startled by the surveying parties in the deeper woods, generally in the vicinity of a lake or stream, or in the bog forests. The regular swamp woods is a favorite resort of this wilderness freebooter, and there it sleeps in seclusion during the day and thence makes its nightly forays.

Of the owls noted elsewhere in the state of New York I failed to find at Cranberry Lake the Saw-whet, Barred, Long-eared or Screech Owl. Reasons for their absence have been discussed elsewhere in this report.

BALD EAGLE. *Haliaeetus leucocephalus leucocephalus* (Linn.)

A Bald Eagle, an adult with a fine white head, lived all summer along the shores between Barber Point and Wanakena. Sometimes it was seen perched in a dead tree at the water's edge, and at other times it would be flapping slowly over the lake, or else soaring high above it and the surrounding mountains.

BROAD-WINGED HAWK. *Buteo platypterus* (Vieill.)

The Broad-winged Hawk was seen several times at Cranberry Lake. One, in juvenile plumage, on August 16, alighted in a tall dead tree, where it preened and sunned itself for many minutes, apparently unconcerned about its surroundings. A pair of Yellow-

bellied Sapsuckers frolicked in this tree top and another near by, frequently alighting near the hawk as they swung back and forth from one tree to another. A Wood Pewee was also foraging out from this same tree, and a Robin crossed the area, stopping in the tree near the hawk without apparent fear. After a while the hawk was startled by the report of a small rifle; it arose, and began soaring until it was lost high in the upper air. The Broad-winged Hawk takes the place in this region of the Red-tailed and Red-shouldered Hawks, neither of which belongs to the fauna about Cranberry Lake. Other absentees are the Goshawk, Sparrow Hawk, Cooper's Hawk and the Sharp-shinned; and the Marsh Hawk was seen but once. More to be expected, but not seen, were the Fish Hawk and the Duck Hawk.

CANADA RUFFED GROUSE. *Bonasa umbellus togata* (Linn.)

The Canadian variety of the Ruffed Grouse was met with chiefly in the borders of the woods, or in the open parts of the Burn, or on the edges of the clearings. In illuminated open bogs this grouse likes to feed in the patches of jewelweed, where it eats the succulent stems. Ordinarily in the fruit season it resorts to the Burn, where there are open spots of burned duff and soil, with blueberry and raspberry bushes for ready cover and convenient foraging. The broods are running about early in June, and thereafter the female will be found in attendance upon the youngsters as they learn the art of self-dependence in the wilderness. The drumming of the male is heard well into the summer, long after the young are under the care of the mother bird, or at least in the early days of July.

The Spruce Partridge was not found, and is now very rare in all parts of the Adirondacks.

SPOTTED SANDPIPER. *Actitis macularia* (Linn.)

Length 7.5. Brownish gray above with a faint greenish lustre, *thickly spotted* below.

The Spotted Sandpiper lives along the low inlets at various places on Cranberry Lake, preferably where there are stretches of sand beach with sparse bushes and shrubs as a background. A pair or two in each suitable locality is about all one finds in the Cranberry Lake district. This sandpiper seems to be restricted to the shores of lakes and ponds.

SOLITARY SANDPIPER. *Helodromas solitarius solitarius* (Wils.)

Length 8.5. Neck and breast streaked; sides barred; tail white, barred with black; belly white.

The Solitary Sandpiper was met with along the brook, where shallow pools are caused by the level stretches being crowded with alder growth, and is not often seen on the sand and pebble beaches. This sandpiper was not noted until early in August, and probably does not maintain a summer residence in the region.

GREAT BLUE HERON. *Ardca herodias herodias* Linn.

Great Blue Herons were seen at Cranberry Lake every day during the season of 1916, and at least one pair fed regularly between Barber Point and Wanakena. This heron frequents the flooded inlets, foraging along the low margins of the shallow water. Eaton ('10, p. 254) mentions several heronries in the Adirondack region, "the largest probably being in the vicinity of Saranac and Cranberry Lakes." If there is at present a heronry of any size near Cranberry Lake there was little evidence of it in the summer of 1916. Vague rumors of a heronry were current in the neighborhood but not half a dozen pairs of the Great Blue Heron were feeding at the Lake in 1916.

WOOD DUCK. *Aix sponsa* (Linn.)

The Wood Duck was observed several times, chiefly on secluded ponds set in the virgin woods. In these retired solitudes the Wood Duck manifests little alarm when its retreat is invaded, and without taking flight the two, which are usually in close company, paddle quietly away.

BLACK DUCK. *Anas rubripes* Brewst.

The Black Duck frequents the inlets of Cranberry Lake, and usually at least one pair would be associated with each inlet of the Lake, where they feed in the shallows of overflowed shores. Toward the end of June they would appear with their broods, leading the young to their regular quarters in the inlets and there training them to become self-dependent.

MERGANSER. *Mergus americanus* Cass.

The Merganser was seen regularly at Cranberry Lake, usually frequenting the inlets in the earlier portion of the season. After the young are taken from the nest, the adult leads them up the brooks, where they remain under parental care while learning to catch small fish. The youngsters seem quite at home in the foaming water of the rapids, and permit themselves to bob about like corks in the swift currents. The Merganser appears to resort to the brooks more than do the other ducks of the region.

HERRING GULL. *Larus argentatus* Pont.

The Herring Gull is represented at Cranberry Lake by several pairs that live on the shore between Wanakena and Barber Point. These gulls forage rather widely, and commonly follow the shoreline quite closely, looking for refuse cast up by the waves.

LOON. *Gavia immer* (Brünn.)

The Loon was represented by two pairs, at least, at the southern end of the lake. They were seen and heard every day, and their weird calls were a conspicuous feature of summer life at the lake. One pair had a nest on a small, low island near Jo Indian. The

nest was on the sloping rocky ground about three feet from the water's edge, in a spot overhung by brush so that it was partially concealed; it was made of short pieces of rootlets from the adjacent shrubs, laid together in a depression of the soil on the rock. There were two eggs in this nest, from which one young bird was hatched, and the other egg was abandoned. The pieces of root of which this nest was composed were from one-fourth to one-half an inch in diameter and from four to six or eight inches long, the whole making a very substantial framework.

List of Birds Observed Near Cranberry Lake, New York

1. Bluebird *Sialia sialis sialis* (Linn.)
2. Robin *Planesticus migratorius migratorius* (Linn.)
3. Hermit Thrush *Hylocichla guttata pallasii* (Cab.)
4. Olive-backed Thrush *Hylocichla ustulata swainsoni* (Tschudi)
5. Wilson's Thrush *Hylocichla fuscescens fuscescens* (Steph.)
6. Golden-crowned Kinglet *Regulus satrapa satrapa* Licht.
7. Chickadee *Penthestes atricapillus atricapillus* (Linn.)
8. Red - breasted Nuthatch *Sitta canadensis* Linn.
9. White - breasted Nuthatch *Sitta carolinensis carolinensis* Lath.
10. Brown Creeper *Certhia familiaris americana* Bonap.
11. Winter Wren *Tannus hiemalis hiemalis* (Vieill.)
12. House Wren *Troglodytes ædon ædon* Vieill.
13. Brown Thrasher *Toxostoma rufum* (Linn.)
14. Catbird *Dumetella carolinensis* (Linn.)
15. Redstart *Setophaga ruticilla* (Linn.)
16. Canada Warbler *Wilsonia canadensis* (Linn.)
17. Maryland Yellowthroat *Geothlypis trichas trichas* (Linn.)
18. Mourning Warbler .. *Oporornis philadelphia* (Wils.)
19. Water-Thrush *Sciurus noveboracensis noveboracensis* (Gmel.)
20. Oven-bird *Sciurus aurocapillus* (Linn.)
21. Black-throated Green Warbler *Dendroica virens* (Gmel.)
22. Blackburnian Warbler *Dendroica fusca* (Müll.)
23. Black-poll Warbler.. *Dendroica striata* (J. R. Forst.)
24. Chestnut-sided Warbler *Dendroica pensylvanica* (Linn.)
25. Magnolia Warbler .. *Dendroica magnolia* (Wils.)
26. Myrtle Warbler *Dendroica coronata* (Linn.)

27. Black-throated Blue Warbler *Dendroica caerulescens caerulescens* (Gmel.)
28. Yellow Warbler *Dendroica aestiva aestiva* (Gmel.)
29. Northern Parula Warbler *Compsothlypis americana pusilla* (Wils.)
30. Nashville Warbler *Vermivora ruficapilla ruficapilla* (Wils.)
31. Black and White Warbler *Mniotilta varia* (Linn.)
32. Blue-headed Vireo *Lanius solitarius solitarius* (Wils.)
33. Warbling Vireo *Vireosylva gilva gilva* (Vieill.)
34. Red-eyed Vireo *Vireosylva olivacea* (Linn.)
35. Migrant Shrike *Lanius ludovicianus migrans* W. Palmer
36. Cedar Waxwing *Bombicilla cedrorum* Vieill.
37. Rough-winged Swallow *Stelgidopteryx serripennis* (Aud.)
38. Bank Swallow *Riparia riparia* (Linn.)
39. Tree Swallow *Iridoprocne bicolor* (Vieill.)
40. Barn Swallow *Hirundo erythrogastra* Bodd.
41. Cliff Swallow *Petrochelidon lunifrons lunifrons* (Say)
42. Scarlet Tanager *Piranga erythromelas* Vieill.
43. Indigo-bird *Passerina cyanea* (Linn.)
44. Rose-breasted Grosbeak *Zamelodia ludoviciana* (Linn.)
45. Lincoln's Sparrow *Melospiza lincolni lincolni* (Aud.)
46. Song Sparrow *Melospiza melodia melodia* (Wils.)
47. Slate-colored Junco *Junco hyemalis hyemalis* (Linn.)
48. Field Sparrow *Spizella pusilla pusilla* (Wils.)
49. Chipping Sparrow *Spizella passerina passerina* (Bech.)
50. White-throated Sparrow *Zonotrichia albicollis* (Gmel.)
51. Savannah Sparrow *Passerculus sandwichensis savanna* (Wils.)
52. Vesper Sparrow *Poæetes gramineus gramineus* (Gmel.)
53. Pine Siskin *Spinus pinus* (Wils.)
54. Goldfinch *Astragalinus tristis tristis* (Linn.)
55. White-winged Crossbill *Loxia leucoptera* Gmel.
56. Common Crossbill *Loxia curvirostra minor* (Brehm)
57. Purple Finch *Carpodacus purpureus purpureus* (Gmel.)
58. Bronzed Grackle *Quiscalus quiscula ancus* Ridgw.
59. Rusty Blackbird *Euphagus carolinus* (Müll.)
60. Baltimore Oriole *Icterus galbula* (Linn.)
61. Red-winged Blackbird *Agelaius phœniceus phœniceus* (Linn.)
62. Cowbird *Molothrus ater ater* (Bodd.)
63. Crow *Corvus brachyrhynchos brachyrhynchos* Brehm

64. Northern Raven *Corvus corax principalis* Ridgw.
65. Canada Jay *Perisoreus canadensis canadensis*
(Linn.)
66. Blue Jay *Cyanocitta cristata cristata* (Linn.)
67. Prairie Horned Lark. *Otocoris alpestris praticola* Hensh.
68. Least Flycatcher *Empidonax minimus* (W. M. & S. F. Baird)
69. Alder Flycatcher *Empidonax trailli alnorum* Brewst.
70. Yellow - bellied Fly-catcher *Empidonax flaviventris* (W. M. & S. F. Baird)
71. Wood Pewee *Myiochanes virens* (Linn.)
72. Olive - sided Fly-catcher *Nuttallornis borealis* (Swains.)
73. Phoebe *Sayornis phoebe* (Lath.)
74. Crested Flycatcher .. *Myiarchus crinitus* (Linn.)
75. Kingbird *Tyrannus tyrannus* (Linn.)
76. Ruby-throated Hummingbird *Archilochus colubris* (Linn.)
77. Chimney Swift *Chætura pelagica* (Linn.)
78. Nighthawk *Chordeiles virginianus virginianus*
(Gmel.)
79. Whip-poor-will *Antrostomus vociferus vociferus*
(Wils.)
80. Northern Flicker ... *Colaptes auratus luteus* Bangs
81. Red-headed Woodpecker *Melanerpes erythrocephalus* (Linn.)
82. Northern Pileated Woodpecker *Phloxotomus pileatus abieticola* (Bangs)
83. Yellow-bellied Sapsucker *Sphyrapicus varius varius* (Linn.)
84. American Three-toed Woodpecker *Picoides americanus americanus*
Brehm
85. Arctic Three-toed Woodpecker *Picoides arcticus* (Swains.)
86. Downy Woodpecker.. *Dryobates pubescens medianus*,
(Swains.)
87. Hairy Woodpecker .. *Dryobates villosus villosus* (Linn.)
88. Belted Kingfisher ... *Ceryle alcyon alcyon* (Linn.)
89. Great Horned Owl.. *Bubo virginianus virginianus* (Gmel.)
90. Bald Eagle *Haliaëtus leucocephalus leucocephalus*
(Linn.)
91. Broad-winged Hawk. *Buteo platypterus* (Vieill.)
92. Marsh Hawk..... *Circus hudsonius* (Linn.)
93. Canada Ruffed Grouse *Bonasa umbellus togata* (Linn.)
94. Spotted Sandpiper .. *Actitis macularia* (Linn.)
95. Solitary Sandpiper... *Helodromas solitarius solitarius*
(Wils.)

96. Great Blue Heron... *Ardea herodias herodias* Linn.
 97. Wood Duck *Aix sponsa* (Linn.)
 98. Black Duck *Anas rubripes* Brewst.
 99. Merganser *Mergus americanus* Cass.
 100. Herring Gull *Larus argentatus* Pont.
 101. Loon *Gavia immer* (Brünn.)

LIST OF REFERENCES

- ADAMS, CHARLES C.
 1908. The Ecological Succession of Birds. The Auk, Vol. 25, pp. 109-153.
- ALLEN, F. H.
 1902. The Song-notes of the Alder Flycatcher. The Auk, Vol. 19, pp. 84-85.
- ALLEN, GLOVER M.
 1903. The Birds of New Hampshire. Proc. Manchester Inst. Arts and Sci., pp. 3-222. Manchester, N. H.
- BAGG, E.
 1887. Nesting of the Black-throated Blue Warbler. Ornithologist and Oologist, Vol. 12, pp. 90-91.
 1912. Annotated List of the Birds of Oneida County, New York. Trans. Oneida Hist. Soc., Vol. 12, pp. 16-85.
- BEAL, F. E. L.
 1900. Food of Bobolink, Blackbirds, and Grackles. U. S. Dept. Agr., Biol. Surv., Bull. No. 13, pp. 3-77.
 1906. Birds as Conservators of the Forest. Rep. N. Y. Forest, Fish and Game Comm., pp. 235-274.
 1911. Food of the Woodpeckers of the United States. U. S. Dept. Agr., Biol. Surv. Bull. No. 37, pp. 3-64.
- BICKNELL, E. P.
 1882. A Review of the Summer Birds of a part of the Catskill Mountains, with Prefatory Remarks on the Faunal and Floral Features of the Region. Trans. Linn. Soc., N. Y., Vol. 11, pp. 113-168.
- BRAY, W. L.
 1915. The Development of the Vegetation of New York State. New York State College of Forestry, Tech. Pub. No. 3, pp. 1-186.
 1921. History of Forest Development on an Undrained Sand Plain in the Adirondacks. New York State College of Forestry, Tech. Pub. No. 13, pp. 1-47.
- BURNS, FRANK L.
 1900. A Monograph of the Flicker. Wilson Bulletin, Vol. 12, pp. 2-82.
 1915. Second Sectional Bird Census, 1914; taken at Berwyn, Chester County, Pennsylvania. Bird Lore, Vol. 17, pp. 109-111.

CARY, MERRITT.

1911. A Biological Survey of Colorado. U. S. Dept. Agr., Biol. Surv. North Amer. Fauna No. 33, pp. 1-256.

CHAPMAN, FRANK M.

1897. Bird-Life. Pp. 1-269. New York.
1903. The Economic Value of Birds to the State. Seventh Ann. Rep. N. Y. Forest, Fish and Game Comm., pp. 115-176.

COOKE, WELLS W.

1915. Preliminary Census of Birds of the United States. U. S. Dept. Agr. Bull. 187, pp. 1-11.
1916. Second Annual Report of Bird Counts in the United States with Discussion of Results. U. S. Dept. Agr., Bull. 396, pp. 1-20.

EATON, ELON H.

- 1910-14. Birds of New York. N. Y. State Mus. Memoir 12, Vol. 1, pp. 1-501; Vol. 2, pp. 1-719, 1914. Albany.
1918. The Relation of Predacious Birds to Forestry. Empire Forester, The New York State College of Forestry, Vol. 4, pp. 25-28.

ECKSTORM, FANNY H.

1901. The Woodpeckers. Pp. 1-131. Boston.

FISHER, A. K.

1893. Hawks and Owls of the United States in their Relation to Agriculture. U. S. Dept. Agr., Div. Ornith. and Mam., Bull. No. 3, pp. 1-210.
1908. The Economic Value of Predacious Birds and Mammals. U. S. Dept. Agr. Yearbook, 1908, pp. 187-194.

FORBES, S. A.

1882. The Regulative Action of Birds Upon Insect Oscillations. Bull. Ill. State Lab. of Nat. Hist., Vol. 1, pp. 1-32.
1907. An Ornithological Cross-section of Illinois in Autumn. Bull. of the Ill. State Lab. of Nat. Hist., Vol. 7, pp. 305-335.
1908. The Mid-Summer Bird Life of Illinois: A Statistical Study. Amer. Nat., Vol. 42, pp. 505-519.

FORBUSH, E. H.

1913. Useful Birds and Their Protection. Mass. State Board of Agr. Pp. 1-451. Boston.
1916. The Natural Enemies of Birds. Mass. State Board of Agr., Econ. Biol. Bull. No. 3, pp. 3-58. Boston.

GAIGE, F. M.

1914. The Birds of Dickinson County, Michigan. Sixteenth Rep. Mich. Acad. Sci., pp. 74-91.

GATES, FRANK C.

1911. Summer Bird Life in Illinois. *Wilson Bull.* Vol. 23, pp. 1-27.

HALL, F. H.

1906. Some Western Adirondack Birds. *Wilson Bull.*, Vol. 18, pp. 120-127.

HOAG, B.

1894. Nesting of the Magnolia Warbler, Stephentown, N. Y. *The Nidologist*, Vol. 1, pp. 87-88.

HOFFMANN, RALPH.

1904. A Guide to the Birds of New England and Eastern New York. Pp. 3-357. Boston.

HOWARD, H. ELIOT.

1920. Territory in Bird Life. Pp. 1-308. New York.

KELLS, W. L.

1887. Nesting of the Black-throated Blue Warbler. *Ornithologist and Oologist*, Vol. 12, pp. 76-77.
1889. Nesting of the White-throated Sparrow. *Ornithologist and Oologist*, Vol. 14, pp. 184-185.

MCATEE, W. L.

1908. Food Habits of the Grosbeaks. U. S. Dept. Agr., Biol. Surv. Bull. No. 32, pp. 1-92.
1911. Woodpeckers in Relation to Trees and Wood Products. U. S. Dept. Agr., Biol. Surv. Bull. No. 39, pp. 1-99.
1915. Bird Enemies of Forest Insects. *American Forestry*, Vol. 21, pp. 681-691.

MAXON, W. R.

1903. Notes on the Birds of Madison County, New York. *The Auk*, Vol. 20, pp. 262-266.

MEARNS, EDGAR A.

1878. Remarks on Some of the Birds of Lewis County, Northern New York. *Bull. Nutt. Ornith. Club*, Vol. 3, pp. 52-56; 123-128.
1880. A list of Birds of the Hudson Highlands. *Bull. Essex Inst.*, Vol. 12, pp. 11-25, 109-128. (Separate, pp. 59-73, 75-94.)
1881. Preliminary List of Birds Ascertained to Occur in the Adirondack Region, Northeastern New York. *Bull. Nutt. Ornith. Club*, Vol. 6, pp. 225-235.

MILLER, OLIVE THORNE.

1902. The Song of the Alder Flycatcher. *The Auk*, Vol. 19, p. 289.
1904. With the Birds in Maine. Pp. 1-300. Boston.

MOUSLEY, H.

1919. "The Singing Tree," or How Near to the Nest Do the Male Birds Sing? *The Auk*, Vol. 36, pp. 339-348.
1921. Which Sex Locates the Nesting Locality. *The Auk*, Vol. 38, pp. 321-328.

POSSON, N. F.

1890. The Rough-winged Swallow. *Ornithologist and Oologist*, Vol. 15, pp. 107-108.

RATHBUN, F. R.

1879. A Revised List of the Birds of Central New York. Pp. 1-47. Auburn, N. Y.

RALPH, W. L. and BAGG, E.

1886. Annotated List of the Birds of Oneida County, New York, and of its Immediate Vicinity. *Trans. Oneida Hist. Soc.*, Vol. 3, pp. 101-147.

1890. Additional Notes on the Birds of Oneida County, New York. *The Auk*, Vol. 7, pp. 229-232.

ROOSEVELT, THEODORE, JR., and MINOT, H. D.

1877. The Summer Birds of the Adirondacks in Franklin County, N. Y. Pp. 1-4. New York.

SAUNDERS, ARETAS A.

1914. An Ecological Study of the Breeding Birds of an Area near Choteau, Mont. *The Auk*, Vol. 31, pp. 200-210.

STERLING, E. A.

1902. Adirondack Birds in their Relation to Forestry. *Forestry Quarterly*, Vol. 1, pp. 18-25.

STONE, W., and CRAM, W. E.

1910. *American Animals*. Pp. 3-318. New York.

INDEX

Page numbers referring to descriptions of species are in **black face** type.

A.

- Actitis macularia*, 475, 479.
Agelaius phœniceus phœniceus, 464, 478.
Aix sponsa, 476, 480.
Anas rubripes, 476, 480.
Antrostomus vociferus vociferus, 472, 479.
Archilochus colubris, 471, 479.
Ardea herodias herodias, 476, 480.
Astragalinus tristis tristis, 461, 478.

B.

- Birds, census of, 435.
 destroying tree seedlings, 429.
 enemies of, 432.
 food of, 400.
 in relation to plant lice, 422; wood
 boring beetles, 427, 429.
 list of Cranberry Lake, 477.
 predacious, 433.
 and alders, 429.
 and aspens, 430.
 and balsam fir, 427.
 and beech, 424.
 and birches, 419.
 and fire cherry, 431.
 and hemlock, 425.
 and maple, 423.
 and mountain ash, 431.
 and spruces, 426.
 and tamarack, 429.
 and white pine, 428.
 Blackbird, Red-winged, 464, 478.
 Rusty, 464, 478.
 Bluebird, 439, 477.
 Bog, the, 412.
 birds of, 412, 413.
 description of, 412.
 shrubs of, 412.
Bombycilla cedrorum, 453, 478.
Bonasa umbellus togata, 475, 479.
Bubo virginianus virginianus, 474, 479.
 Burned tract, 408.
 birds of, 411.
 definition of, 408.
 description of, 408.
Buteo platypterus, 474, 479.

C.

- Carpodacus purpureus purpureus*, 463, 478.
 Cats, as enemies of birds, 432.
 Catbird, 446, 477.
 Cedar-bird, 453.

- Certhia familiaris americana*, 444, 477.
Ceryle alcyon alcyon, 474, 479.
Chætura pelagica, 471, 479.
 Chickadee, 443, 477.
Chordeiles virginianus virginianus, 471, 479.
Circus hudsonius, 475, 479.
 Clearings and food supply, 400.
 influence on birds, 403, 404, 407.
Colaptes auratus luteus, 472, 479.
Compsothlypis americana pusilla, 451, 478.
Corvus brachyrhynchos brachyrhynchos, 465, 478.
Corvus corax principalis, 465, 479.
 Cowbird, 465, 478.
 Creeper, Brown, 444, 477.
 Crossbill, Common, 462, 478.
 White-winged, 462, 478.
 feeding on birch seeds, 420.
 Crow, 465, 478.
Cyanocitta cristata cristata, 465, 479.

D.

- Description of western Adirondack
 forest, 399.
 bog, 412.
 burned tract, 408.
 dry grass meadow, 411.
 habitation clearing, 404.
 lumbered clearing, 415.
 open camp site, 402.
 open hardwood forest, 416.
 partial clearing, 402.
 Sucker Brook, 416.
 virgin forest, 415.
Dendroica æstiva æstiva, 451, 478.
cærulescens cærulescens, 450, 478.
 coronata, 450, 477.
 fusca, 448, 477.
 magnolia, 499, 477.
 pensylvanica, 449, 477.
 striata, 448, 477.
 virens, 448, 477.
 Dogs, as enemies of birds, 432.
 Dry grass meadow, 411.
 birds of, 412.
 description of, 411.
 plants of, 411.
Dryobates pubescens medianus, 473, 479.
 villosus villosus, 474, 479.
 Duck, Black, 476, 480.
 Wood, 476, 480.
Dumetella carolinensis, 446, 477.

E.

- Eagle, Bald, 474, 479.
Empidonax flaviventris, 468, 479.
minimus, 466, 479.
traillii alnorum, 466, 479.
Euphagus carolinus, 454, 478.

F.

- Finch, Purple, 463, 478.
 Flicker, Northern, 472, 479.
 Flycatcher, Alder, 466, 479.
 Crested, 469, 479.
 Least, 466, 479.
 Olive-sided, 469, 479.
 Yellow-bellied, 468, 479.
 Forestry Summer Camp, location of, 397.

G.

- Gavia immer*, 476, 480.
Geothlypis trichas trichas, 446, 477.
 Goldfinch, 461, 478.
 Grackle, Bronzed, 463, 478.
 Grosbeak, Rose-breasted, 456, 478.
 feeding on maple buds, 423.
 Grouse, Canada Ruffed, 475, 479.
 Gull, Herring, 476, 480.

H.

- Habitats, minor bird, 397, 402.
 Habitation clearing, 404.
 birds of, 407.
 definition of, 404.
 description of, 404.
 ecological relations of, 407.
Haliaeetus leucocephalus leucocephalus, 474, 479.
 Hawk, Broad-winged, 474, 479.
 Marsh, 475, 479.
Helodromas solitarius solitarius, 475, 479.
 Heron, Great Blue, 476, 480.
Hirundo erythrogastra, 455, 478.
 Hummingbird, Ruby-throated, 471, 479.
Hylocichla fuscescens fuscescens, 442, 477.
guttata pallasii, 440, 477.
ustulata swainsoni, 441, 477.

I.

- Icterus galbula*, 464, 478.
 Indigo-bird, 456, 478.
Iridoprocne bicolor, 455, 478.

J.

- Jay, Blue, 465, 479.
 Canada, 465, 479.
Junco hyemalis hyemalis, 458, 478.
 Junco, Slate-colored, 458, 478.

K.

- Kingbird, 470, 479.
 Kingfisher, Belted, 474, 479.
 Kinglet, Golden-crowned, 443, 477.

L.

- Lanius ludovicianus migrans*, 452, 478.
Lanivireo solitarius solitarius, 452, 478.
 Lark, Prairie Horned, 466, 479.
Larus argentatus, 476, 480.
 Loon, 476, 480.
Loxia curvirostra minor, 462, 478.
leucoptera, 462, 478.
 Lumbered clearing, 415.
 description of, 415.
 location of, 415.

M.

- Mammals, predatory, 401, 432.
Melanerpes, erythrocephalus, 472, 479.
Melospiza lincolni lincolni, 456, 478.
melodia melodia, 458, 478.
 Merganser, 476, 480.
Mergus americanus, 476, 480.
Mniotilta varia, 451, 478.
Molothrus ater ater, 465, 478.
Myiarchus crinitus, 469, 479.
Myiochanes virens, 468, 479.

N.

- Nannus hiemalis hiemalis*, 445, 477.
 Nighthawk, 471, 479.
 Nuthatch, Red-breasted, 443, 477.
 White-breasted, 444, 477.
Nuttallornis borealis, 469, 479.

O.

- Open camp site, 402.
 birds of, 402.
 Open hardwood forest, 416.
 birds of, 416.
 description of, 416.
 plants of, 416.
Oporornis philadelphia, 447, 477.
 Oriole, Baltimore, 464, 478.
Otocoris alpestris praticola, 466, 479.
 Oven-bird, 448, 477.
 Owl, Great Horned, 474, 479.

P.

- Partial clearing, 402.
 adaptable for bird haunts, 403.
 birds of, 402.
 description of, 402.
 Partridge, Canada Spruce, 428, 439.
Passerculus sandwichensis savanna, 461, 478.
Passerina cyanea, 456, 478.
Penthestes atricapillus atricapillus, 443, 477.
Perisoreus canadensis canadensis, 465, 479.
Petrochelidon lunifrons lunifrons, 455, 478.
 Pewee, Wood, 468, 479.
Phlaeotomus pileatus abieticola, 472, 479.
 Phoebe, 469, 479.

Picoides americanus americanus, 473, 479.

arcticus, 473, 479.

Piranga erythromelas, 455, 478.

Planesticus migratorius migratorius, 440, 477.

Poaetes gramineus gramineus, 461, 478.

Predatory animals, role of, 435.

mammals, 401, 432.

birds, 401, 433.

Q.

Quiscalus quiscula æneus, 463, 478.

R.

Raven, Northern, 465, 479.

Red squirrels, as enemies of birds, 432.

Redstart, 446, 477.

References, list of, 480.

Regulus satrapa satrapa, 443, 477.

Riparia riparia, 454, 478.

Robin, 440, 477.

S.

Sandpiper, Spotted, 475, 479.

Solitary, 475, 479.

Sapsucker, Yellow-bellied, 473, 479.

sap-sucking habit of, 420.

Sayornis phæbe, 469, 479.

Seiurus aurocapillus, 448, 477.

noveboracensis noveboracensis, 447, 477.

Setophaga ruticilla, 446, 477.

Shrike, Migrant, 452, 478.

Sialia sialis sialis, 439, 477.

Siskin, Pine, 461, 478.

Sitta canadensis, 443, 477.

carolinensis carolinensis, 444, 477.

Snakes, as enemies of birds, 401, 435.

Snowbird, 458.

Sparrow, Chipping, 459, 478.

Field, 459, 478.

Lincoln's, 456, 478.

Savannah, 461, 478.

Song, 458, 478.

Vesper, 461, 748.

White-throated, 459, 478.

Sphyrapicus varius varius, 473, 479.

Spinus pinus, 461, 478.

Spizella passerina passerina, 459, 478.

pusilla pusilla, 459, 478.

Stelgidopteryx serripennis, 454, 478.

Sucker Brook, 416.

birds of, 416.

description of, 416.

location of, 416.

Swallow, Bank, 454, 478.

Barn, 455, 478.

Cliff, 455, 478.

Rough-winged, 454, 478.

Tree, 455, 478.

Swift, Chimney, 471, 479.

T.

Tanager, Scarlet, 455, 478.

Thrasher, Brown, 445, 477.

Thrush, Hermit, 440, 477.

Olive-backed, 441, 477.

Wilson's, 442, 477.

Toxostoma rufum, 445, 477.

Trees of the Adirondack mixed forest, 399.

influence on birds, 416.

Troglodytes ædon ædon, 445, 477.

Tyrannus tyrannus, 470, 479.

V.

Veery, 442.

Vermivora ruficapilla ruficapilla, 451, 478.

Vireo, Blue-headed, 452, 478.

Red-eyed, 452, 478.

Warbling, 452, 478.

Vireosylva gilva gilva, 452, 478.

olivacea, 452, 478.

Virgin forest, 415.

birds of, 415.

description of, 415.

location of, 415.

W.

Warbler, Blackburnian, 448, 477.

Black-poll, 448, 477.

Black-throated Blue, 450, 478.

Black-throated Green, 448, 477.

Black and White, 451, 478.

Canada, 446, 477.

Chestnut-sided, 449, 477.

Magnolia, 449, 477.

Mourning, 447, 477.

Myrtle, 450, 477.

Nashville, 451, 478.

Northern Parula, 451, 478.

Summer, 451.

Yellow, 451, 478.

Yellow-rumped, 450.

Water-Thrush, 447, 477.

Waxwing, Cedar, 453, 478.

Weasels, as enemies of birds, 433.

Whip-poor-will, 472, 479.

Wilsonia canadensis, 446, 477.

Woodpecker, American Three-toed, 473, 479.

Arctic Three-toed, 473, 479.

Downy, 473, 479.

Hairy, 474, 479.

Northern Pileated, 472, 479.

Red-headed, 472, 479.

Wren, House, 445, 477.

Winter, 445, 477.

Y.

Yellow-throat, Maryland, 446, 477.

Z.

Zamelodia ludoviciana, 456, 478.

Zonotrichia albicollis, 459, 478.

NOTES ON THE RELATION OF BIRDS TO ADIRONDACK FOREST VEGETATION

By DR. CHARLES C. ADAMS, DIRECTOR

CONTENTS

1. Introduction.
2. General Character of the Region.
3. Influence of Birds Upon the Vegetation.
 Reforestation by Birds.
 Influence of Sapsuckers on Forest Trees.
4. Fermented Sap and Sapsuckers.
5. Summary and Conclusions.
6. Selected References.

INTRODUCTION

One of the most pleasant aspects of working in the forest is that it is always changing, not only with the season but also from year to year so that it is always interesting. To learn the laws of these changes, and to know how to mould them to man's advantage, are most important parts in the training of a forester.

The forest is a community of living things, dominated by the trees, and with the shrubby and herbaceous plants living in a subordinate relation. The forest ecologically is even more than this, because all forests contain, in addition to vegetation, a large number of animals which make their home there. We may call such a collection of plants and animals living together a forest association or a forest biotic community. In such a community the trees and shrubs influence the animals, as, for example, in the production of food or shelter; and in turn the animals influence the trees and other vegetation by feeding upon them, or by scattering their seeds and thus extending and aiding the reproduction of the forest. Forests and animals thus influence one another in a vast number of ways and the present paper is intended to call attention to some of the more conspicuous methods in which birds influence forest vegetation in the Adirondacks. I have known men who have spent considerable time in the woods, and yet have failed to observe and understand the results of bird activity. On the other hand, to many observant persons familiar with the woods, the notes here recorded will seem commonplace indeed. It is desirable that foresters possess a proper idea of the general importance of birds to the forest, just as a similar appreciation of the influence of forests upon birds is needed by students of birds and by the public in general.



Fig. 142. Sketch map of College of Forestry Summer Camp grounds, at Barber Point, Cranberry Lake, 1915. Adapted from S. N. Riggs.

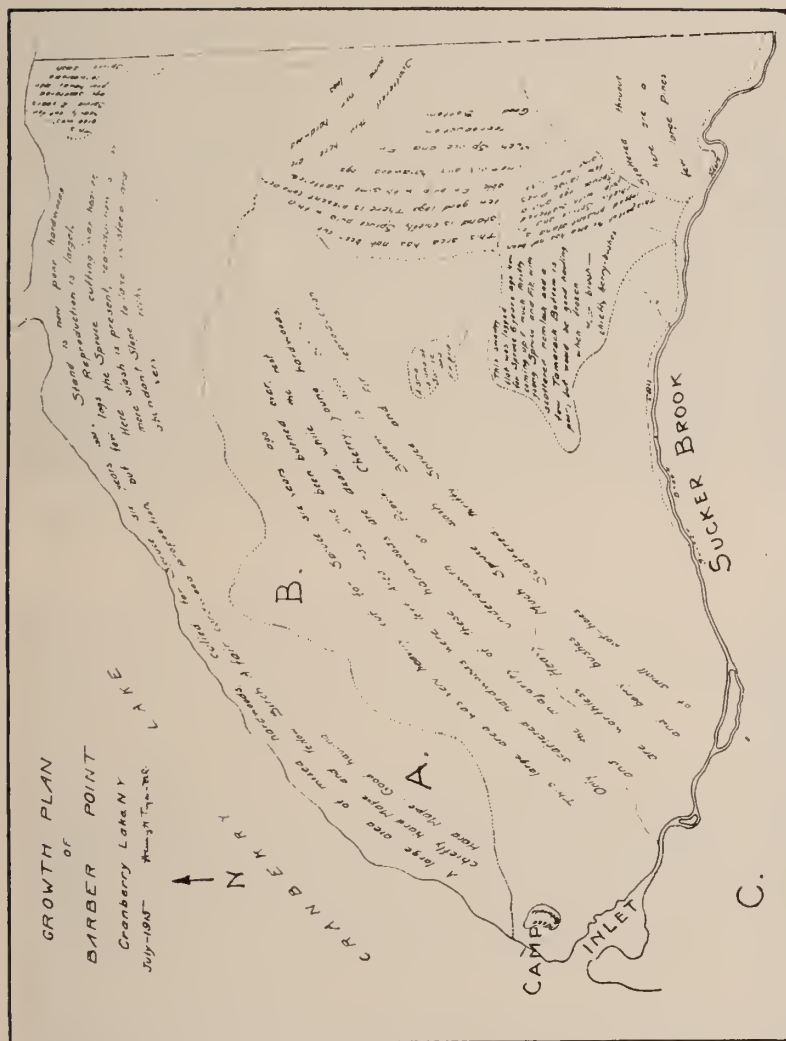


Fig. 143. Sketch map of forest conditions, Barber Point, Cranberry Lake, Wanakena, N. Y. A. Burned area. B. Hardwood forest. C. Hardwood forest. Adapted from H. H. Tryon.

GENERAL CHARACTER OF THE REGION

During August of 1915 and again in 1916 I spent several days at the Sophomore Summer Camp of The New York State College of Forestry, at Barber Point, Cranberry Lake, Wanakena, N. Y. This camp is situated on the southeastern side of Cranberry Lake, south of East Inlet, and on the north bank at the mouth of Sucker Brook (figures 142 and 143). The region about the Camp was lumbered in 1909 and 1910 and was largely burned over in 1911. The unburned cut-over forest is composed largely of hardwoods, crippled trees, gnarled, fungus infested, and decayed trunks left when the red spruce (*Picea rubra*) and balsam fir (*Abies balsamea*) were cut. The virgin forest consisted of the hardwoods, hard maple (*Acer saccharum*), yellow birch (*Betula lutea*) and beech (*Fagus americana*), with scattered canoe birch (*Betula alba papyrifera*), quaking aspen (*Populus tremuloides*), large-toothed aspen (*Populus grandidentata*) and bird or fire cherry (*Prunus pennsylvanica*). Mixed with these hardwoods were the hemlock (*Tsuga canadensis*) and red spruce (*Picea rubra*), balsam fir (*Abies balsamea*) and white pine (*Pinus Strobus*).

An unburned area, lumbered for spruce (figures 143-A and 144) lay to the north and east of the Camp, as a broad strip along the lakeshore, where it appears to have been protected from fire by a ridge bounding it on the south and east. To the east and northeast of Camp lay the large burned area with its dead and largely branchless stubs, with an undergrowth of bird cherry, red raspberries (*Rubus idaeus*) and other plants (figures 143-B and 145). Many of the cherry trees were not in fruit but others bore in abundance. The raspberries were loaded with fruit. Immediately south of Sucker Brook was also a lumbered area (figure 143-C), now largely hardwoods, with much undergrowth (figure 146), which was formerly logged for spruce. Alder (*Alnus*) and willows (*Salix*) bordered the brook.

Most of the area was of low topographic relief, although the rock ridge, which extended to the northeast of Camp, reached an elevation of about 330 feet as was shown by the surveying students working with Mr. H. H. Tryon. East of Camp, about three miles, was a beautiful virgin forest composed of yellow birch, hemlock, red spruce, white pine and scattered balsam fir (figure 147).

INFLUENCE OF BIRDS UPON THE VEGETATION

In the time at my disposal, not much attention was devoted to determining the kinds or species of birds present in the region, because I was chiefly interested in seeking for evidence which would show the influence of birds in general on the forest. At Cranberry Lake were two phases of bird activity to which I gave attention because of their intimate relation to forestry. I refer to the scattering or dispersal of vegetation by birds (and small mammals) in the burned areas, and to the injury to trees by the Yellow-bellied Sapsucker (*Sphyrapicus varius varius*). The relation of birds to



Fig. 144. Cut-over hardwood forest north of Camp (Fig. 143, A). Undergrowth largely bird cherry planted by birds. Photo 1915.



Fig. 145. Burned area east of Camp (Fig. 143, B); showing bird cherry, berry bushes and fireweed. Photo 1915.



Fig. 146. Cut-over forest of hardwoods, south of Sucker Brook, 1916. (Fig. 143, C) ; showing extensive undergrowth of berry bushes.



Fig. 147. Virgin forest at Curtis Pond, northeast of Forestry Camp; chiefly of hemlock and spruce. Photo 1915.

injurious forest insects, one of the most important relations of birds to forests, was not considered in the limited time available for field study.*

Reforestation by Birds. That birds eat many kinds of wild fruits is well known to observers of their feeding habits. For example, 39 species of birds are recorded (McAtee '10, p. 186) to feed upon wild cherries (*Prunus*), while raspberries and blackberries are known to be eaten by 60 species of birds. In general the kinds of bird-planted fruits are those that possess three characteristics: an attractive pulp or nourishing fruit; sufficiently small size to be readily swallowed; and seeds which in some manner are able to resist digestion while in the body of the animal—otherwise, of course, the seed would be destroyed, and could not be dropped on some favorable site. Their preservation is usually accomplished by a non-digestible covering that surrounds the germ. Some seeds are also scattered by regurgitation.

The presence in the region of the Cedar-bird (*Bombycilla cedrorum*), Robin (*Planesticus migratorius migratorius*), Catbird (*Dumetella carolinensis*), Ruffed Grouse (*Bonasa umbellus togata*), and many other birds known to eat fruits is a sufficient guarantee, if any were necessary, that birds are available agencies for scattering seeds.

Small red cherries were very abundant locally along Sucker Brook, where great numbers of Cedar-birds were seen perched upon the burned stubs. Never have I seen a greater abundance of wild red raspberry fruit than abounded in the burned and other open places. The amount of this food was far in excess of that which the birds and other animals of the vicinity were able to utilize, and as a result it decayed by the bushel. The stomach of one Cedar-bird was found to contain four cherry stones. On one field-trip Mr. W. E. Sanderson found a Robin's nest with two young beside a stump on the bank of a very small stream, near where the stream from Curtis Pond crosses the logging road to Sucker Brook. When the nest was visited again six days later (August 24), during which interval there had been a severe downpour, the young birds were found dead in the nest. (The dead birds were determined by Mr. W. DeW. Miller, of the American Museum of Natural History). In and about this nest I counted 145 cherry stones which could be counted without destroying the nest, and some stones were left in the field when the nest was collected. Such an accumulation of stones about the nest shows clearly the importance of this fruit in the diet of the Robin. With high water these cherry stones would be transported to other localities and scattered.

Five caged fledged nestlings of the Cedar-bird were fed by Bolles ('90, p. 290) 8,400 cherries in 12 days. He says: "On the average the old bird or birds made 140 visits a day, bringing five cherries each time. One was carried in the beak, and the others were jerked up from the throat one by one until all of the five young were fed."

* Those interested in this phase should consult Sterling ('02) and especially McAtee ('15).

Herrick ('02, p. 61) also gives a very interesting account of food of the young birds as follows:

"The young at this nest were visited and fed 47 times during an interval of exactly ten hours and forty-seven minutes, on three different days. On the last day they were fed on the average once in ten minutes. The food consisted of choke cherries and red bird cherries, varied with raspberries, blackberries, and blueberries, together with insects, which, during the last days of life at the nest, constituted about one quarter of the fare. At one half the number of visits recorded fruit alone was served. From six to ten cherries were brought in the gullet at a time, and once by count eleven blueberries. Feeding was effected almost always by regurgitation in whole or part, and rarely was any food visible when the birds came to the nest. Now and then, however, a bird would approach loaded to the muzzle with a berry or insect in the bill to round out the measure. Soft fruits like raspberries were crushed to a pulp, and insects which are commonly served with berries came up covered with saliva, and often in an unrecognizable state. The staple animal food was grasshoppers and I have seen the large cicada or harvest fly brought to the nest, but never dragon-flies, butterflies, or moths. The cicada made a lively struggle for a few minutes; it was placed in one open throat after another and withdrawn eight different times, before a gullet was found capable of the proper reaction time. If a bird was slow he lost his chance, and another was tried. The key was at last fitted to the lock, and the bruised and battered cicada was taken in, but the old bird had not finished her task. She began tossing up her head and producing bird cherries. Then she gave the nest a thorough renovation. In doing this the mother often walks around the rim, and attends to each nestling in succession, sometimes even inspecting one bird more than once."

Considering the abundance of Cedar-birds, the abundant fruit of the cherry, and the great number of young trees in the burned and cut-over areas (figure 145), it is very evident that this bird is one of the most important tree planters in the burned lands of the Adirondacks. Of course we must not overlook the fact, in fairness to other birds, that many other species have much the same influence in scattering seeds. It is also only fair to state that it is well established that *all* the seeds scattered by birds are not of advantage to the forest. For example, the seeds of many vines are scattered by birds, such as wild grape, five-leaved ivy and poison ivy. Such vines, when they thrive luxuriantly and reach the crowns of trees are able to shut off the light and thereby injure or kill the tree. I have observed many such instances where this kind of harm has been done. During the heavy snow in the upper Hudson Valley in December, 1915, many trees were seen bent down by the weight of the snow that accumulated on the screen of vines. In the Adirondacks, where the snowfall is very heavy, I would suppose that such injury would be of frequent occurrence.

We may not look upon bird or fire cherry with much favor as a forest tree, but such a tree and raspberry bushes produce a vegeta-

tional cover, under whose shade more valuable trees do grow, and further, such vegetation will retard erosion of the soil and its runoff much better than a sparse vegetation. That the growth of cherry, aspens, etc., is favorable to the reproduction of more valuable trees is well known, and is expressed by Frothingham ('11, p. 24), who says: "Just as fire cherry and other small or short-lived trees and shrubs form 'temporary' stands over aspen, so the aspen, in most of its extensive stands, is itself merely temporary, and gives place, within a single generation, to relatively permanent stands of more shade-enduring and longer-lived species, from which aspen is permanently excluded." He names among the more important eastern seedlings which grow up in these temporary stands the red and white spruce, beech, maple, balsam fir and white pine. (For the relation of aspens to reforestation in the Southwest see Pearson '14). From the standpoint also of the hunter such a cover is a vast improvement on bare burned-over land. The relation of birds to game, although the influence of the birds is not definitely mentioned, is clearly shown by the fact, as Gaylord has shown, that in the Adirondacks deer thrive best in open woods, such as may be formed by lumbering, or in burns after vegetation has again become established. He says ('15, p. 29): "Out of the 50,000 acres immediately under my supervision there are 14,000 burned over, and it is here * * * that they [deer] are the most plentiful and in the best condition — why?— simply because the food supply is the best and the most abundant, due to the numerous vines, grasses, and bushes that grow in such places."

We must therefore look upon the scattering of seeds by birds and other wild animals as a method of *reforestation* done without charge. This is a very valuable service, which supplements the wind-blown seeds of the aspens and birches. This scattering of tree seeds by birds must therefore be considered as particularly important in wild lands, and the value of this will last until man is alert and progressive enough to do the work better and more intelligently or by hiring men to do it. There are thus excellent reasons why fruit-eating birds should never be needlessly injured in wild lands by foresters and hunters, especially where there is imperfect fire protection, and where game is valued. The destruction of the forest cover is harmful to the flow of streams, and directly to fish; conversely, reforestation is likewise beneficial to fish. In other words, the birds benefit the fish as well as the game. Even at the present rate of progress it will be a long time before the services of such birds can be looked upon as superfluous or harmful, and all they have done up to the present time stands to their credit. It would be very interesting to estimate how much benefit of this kind in dollars has been done by the birds of New York State, for the forests, the hunter and the fisherman. Certainly the people of New York have received many thousands of dollars in benefit from this kind of work by birds.

We are now in a position to see how it is that birds have so much influence in changing the conditions in forests, because we

can see that after a fire birds and the wind re-seed the soil and greatly hasten reproduction. When once the soil is seeded the maturing of the trees in itself gradually changes conditions until a mature forest is developed. But planting and reproduction are not limited to burned areas alone, for the same process is in operation at all times in the forest, at the forest margin and in the open, and thus many trees are planted.

The amount of benefit done by the birds in forests is not uniform, but varies greatly with the conditions. In burned areas plantings are perhaps of greatest value, but after reproduction has been thoroughly established the destruction of potentially harmful insects is probably of greater value. Generally this early vegetation in burns is short lived and is replaced by other kinds of trees in the mature forest, although scattered choke cherry (*Prunus virginiana*) trees may survive even among sugar maple, hemlock and beech. By recalling such facts we are able to see the relative influence or rôle of birds in hastening the cycle of changes from a burn to a mature forest, and to see how they aid in this change, while at the same time they cause no harm of first importance.

Influence of Sapsuckers on Forest Trees. As we have seen that the rôle of birds in scattering seeds on burned areas is a beneficial one, I wish now to consider a somewhat contrary influence—the direct injury to trees by a bird, the Yellow-bellied Sapsucker (*Sphyrapicus varius varius*). In discussing the character of this injury I mean to consider the trees in the order in which they develop after a fire. This is the sequence or succession of reforestation, and this order is followed because of its importance, and because of the value of a familiarity with this particular sequence. For this reason aspen and birch will be considered first, and later beech, hemlock and other trees that characterize a mature forest.

South of Camp, about three-quarters of a mile, is a cove or small bay along the shore of which a fire has burned. An extensive strip of aspens has grown up near the water and in this clump of trembling aspens (*P. tremuloides*) was found much evidence of injury by Sapsuckers (figure 148). Attention was first called to the injury by a mass of dead leaves remaining on a tree. These dead trees were found girdled in the manner characteristic of Sapsuckers. They had evidently been killed during the season of 1915, or the leaves would not have remained on. Other trees were found with the leaves turning yellow, in the act of dying. It was at once seen that the extent of the injury was somewhat unusual, so that a careful search was then made throughout these aspens for other evidences of injury. In all thirty trees were discovered that showed distinct evidences of Sapsucker work. Every stage was found from living injured trees, which had healed their wounds and had recovered completely, to dying, recently dead, and on to dead ones of perhaps a few years standing, with fungi growing on the dead wood (a reddish fungus *Tubercularia pezizoidea* S., and *Valsa*; determined by Dr. L. H. Pennington); and one dead and decayed tree that had been broken by the wind (No. 1). The



Fig. 148. Colony of quaking aspen, south of Camp on shore of lake (shown in distance) where young trees were much injured by Sapsuckers. Photo 1916.



Fig. 149. Sapsucker injury to young aspens.



Fig. 150. Sapsucker injury to young aspens.



Fig. 151. Colony of aspens and birches at Forestry Camp. The aspens were much injured by Sapsuckers. Photo 1916.

injured specimens ranged in diameter from about $\frac{3}{4}$ of an inch to $1\frac{1}{2}$ inches, and each specimen secured represented a single tree and not branches or parts of trees.

One dead tree (No. X) was an excellent example of severe girdling. This tree was 1.25 inches in diameter and very severe girdling extended over 27.5 inches of the stem (figure 149a). The holes were so numerous that long vertical strips of the bark had been removed, or had curled and fallen off as the bark dried out. It was one of the most extensive and thorough injuries observed on an aspen. This tree was probably killed early in the season of 1915. Complete girdling (No. 5), largely concentrated in a seven-inch belt, is well shown in figure 149b, and a similar (No. 12) but even more severe attack is shown in figure 150c.

A dead tree was found which had been girdled in a narrower belt, of about 8 inches in length. In some cases there had been considerable healing (No. 10) and the stem had a knotted or gnarled appearance (figure 150d). In the case of some specimens (No. X, figure 149a, and No. 12, figure 150c), the injury was so extensive that death was rather sudden, for the burrows were fresh and clean cut in appearance, as if no progress had been made toward healing at the time of death. One small tree, $\frac{7}{8}$ inch in diameter (No. 4), showed injury of similar freshness, for the dead leaves were still on, except a very few, which were still green in part (figure 150e). The wounds on this extended over about 14 inches of the stem, and were unusual in that they were very irregular in position, both horizontally and vertically.

Another series of trees had been girdled in varying degrees (Nos. 2, 8, 9, 9a, 9b, 9c, 13, 14, 15, 16 and 17) but were alive. A tree about an inch in diameter (No. 9a) had been severely wounded in patches, for 35 inches along the stem. The gnarled areas are shown in figure 149c. Some of the old wounds are peculiar in that they give the bark the appearance of an irregular flattened or sunken blister, with the central perforation and an elevated rim. These show that irregular areas of about half an inch by three-quarters were killed by the perforation; six of these blisters were found on this stem. Nos. 8 and 9 each showed one of these blisters, and No. 9b showed many of such patches. One (No. 9b) had been severely girdled several years ago and gnarled wounds had developed; it seems to have suffered two or more later attacks, one in the vicinity of the old wound and others near the base of the tree (figure 149d). The main later attack completely encircled the trunk and yet the tree had apparently recovered, or at least looked healthy.

Two live trees had been injured recently (Nos. 13 and 15) so that they might not have revived, as the girdling was very complete and concentrated. One (No. 15) showed the blister effect, another (No. 14) had been severely girdled (figure 150d); considerable progress had been made in healing, as it also had on a less injured one (No. 16). One tree (No. 17) was found dying.

the leaves curled, but not turning yellow, as they sometimes do. This tree had been completely girdled over an area of six inches of the trunk. This injury had reinforced an older one of the same kind that extended around nearly half of the stem. Although the girdling of the tree (No. 2) was very severe, healing had made considerable progress and the leaves were yet green when the tree was cut.

In August, 1916, I again visited this same clump of aspens (figure 148), went over the area in more detail than on the previous year, and found two dead trees (one with brown leaves on), 22 injured (9 severely), and four cases doubtful as to cause of scars. To my surprise no fresh injuries were observed in this place. One tree two inches in diameter was irregularly but completely girdled five feet from the ground, over a six-inch zone, yet looked in good condition.

I wish to refer to only one other kind of influence of the birds in this colony of aspens and that is to the growth of lateral buds or suckers that develop below the girdling of the stem after the upper part dies. I found several good examples of this (Nos. 7, 18, 19, 20, 21 and 22) in 1915, and one (No. 21) in 1916. A small tree, hardly larger than a lead-pencil, had been severely girdled for about ten inches of its stem, and large rectangular patches of the bark had been removed rather recently. Below this injury a big sucker developed, bearing much larger leaves than corresponding ones on the normal tree (figure 150e). Two good examples of these suckers are shown in figures 149e and f. I examined a large colony of aspens in search of larger trees whose tops had been killed but whose suckers had developed and had thus formed a new stem. I found two with bent stems, but no evidence remained to indicate that the stem had been killed by Sapsuckers.

One tree (No. 21) with dead and dry brown leaves on it, had been severely girdled, and some of the bark and wood above the injury was yet green. This tree was $1\frac{1}{4}$ inches in diameter 4 feet above the soil, and the injury began at 34 inches above the ground, but the girdling proper at 37.5 inches, and extended along the trunk for 10 inches. A large sucker grew out at 15.5 inches above the ground, grew for about a foot and then had died at the top.

Many of the small aspens about the Camp showed a few holes made by Sapsuckers in 1915, but in August, 1916, a clump of small trees at the south part of the Camp were the scene of considerable Sapsucker activity (figures 151 and 152.) Four trees were specially noted. Tree No. 1, which was 2.5 inches in diameter 4 feet from the ground, was injured 7 feet from the ground, and the injured zone extended along the trunk for about 2 feet. No. 2 was 3.5 inches in diameter 4 feet above the ground, the injury began at 6 feet above the ground and extended upward about 30 inches, but was mainly concentrated in the first foot. The lower 4 inches, the older injury, was constricted and dried out, while the upper 8 inches was somewhat enlarged and was



Fig. 153. Detailed view of aspen trunks injured by Sapsuckers.



Fig. 152. Nearby view of the aspen clump shown in Fig. 151. Photo 1916.



Fig. 154. Sapsuckers working on aspens. Photo 1916.



Fig. 155. Injury to large-toothed aspen by Sapsucker, at Forestry Camp.

fresh, recent work. This girdling was very thorough and it is remarkable that the tree was not dead. No. 3 was dead with dry leaves attached. It was 2.5 inches in diameter 4 feet above the ground. The girdling began over 5 feet above the soil and extended upwards about 3 feet, but was mainly concentrated. No. 4 was dying, as its leaves had begun to turn slightly yellow. It was 2.2 inches in diameter 4 feet above the ground; girdling (old) began at 4 feet 8 inches, the fresh work began at about 5 feet, 6 inches, and extended up the trunk about 20 inches, and above the concentrated old injury there was an enlargement of the trunk. This detailed character of the injury on each of the tree trunks is shown in figure 153. The older injury was in general lower down on the trunk than the newer. The birds working on these trees were very tame (figure 154), and pounded away within 10 to 15 feet of me, so that the light-colored chips could easily be seen falling as their work progressed. Occasionally they were seen to act as if picking insects from the trunk, and one was observed to leave the tree, and flycatcher-like, attempt catching insects on wing. One very warm day the birds were observed to hold their mouths open as if panting, as poultry sometimes do when overheated. The amount of bark and wood removed at my visit to the trees seemed slight, and it was only by watching the work from day to day that the progressive extension of the injured area became clearly evident.

At the Camp a large-toothed aspen (*Populus grandidentata*) overhung the lakeshore, on which there were numerous sapsucker holes in 1915. The general character of the injury is well shown in figure 155, where a two-foot rule serves as a scale in the illustration. This was the only example of this tree found showing injury. In August, 1916, additional freshly bored scattered holes were noted on this tree.

Near the colony of aspens, which were injured so much (figure 148), were two excellent examples of sapsucker injury to large trees of yellow birch (*Betula lutea*). They stood near the lakeshore in an open burned area. The general character of the injury on one tree is well shown in figure 156, which reveals the scattered holes near the base of the tree and up the trunk to near the lower branches. The concentration of the injury here into vertical rows is characteristic. On such large trees the bark is very thick so that the cavities produced are about a third of an inch deep, and were deeper when the tree was alive. The healthy look of the tree shown in the figure indicates that it had not been injured seriously. A near view of this injury is shown in figure 157. On the other hand, another tree of the same kind near by had been killed by the repeated attacks (figure 158). Some parts of the trunk are weathered and darker stained than other parts, which may be due to a difference in age or to the flow of rain-water down the trunk. A careful examination of the trunk shows no evidence of healing, a fact that suggests a concentrated attack and rather early death. A more detailed view of the trunk is shown in figure 159.

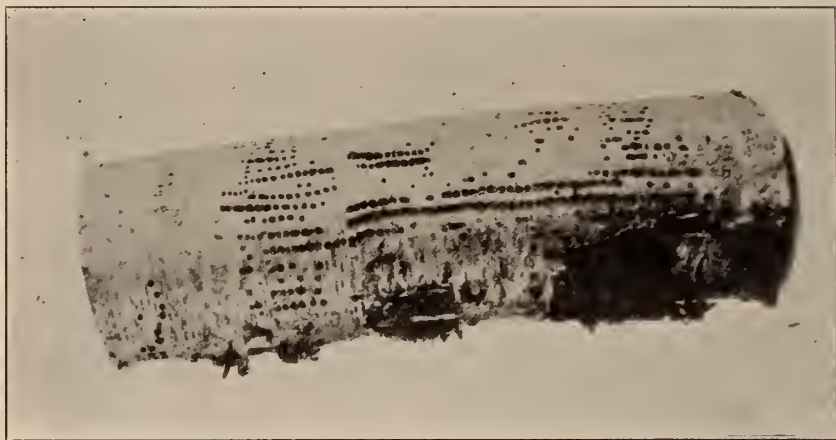


Fig. 157. Detailed view of part of yellow birch trunk shown in Fig. 156



Fig. 156. A yellow birch south of the Camp, injured by Sapsuckers. Photo 1915.

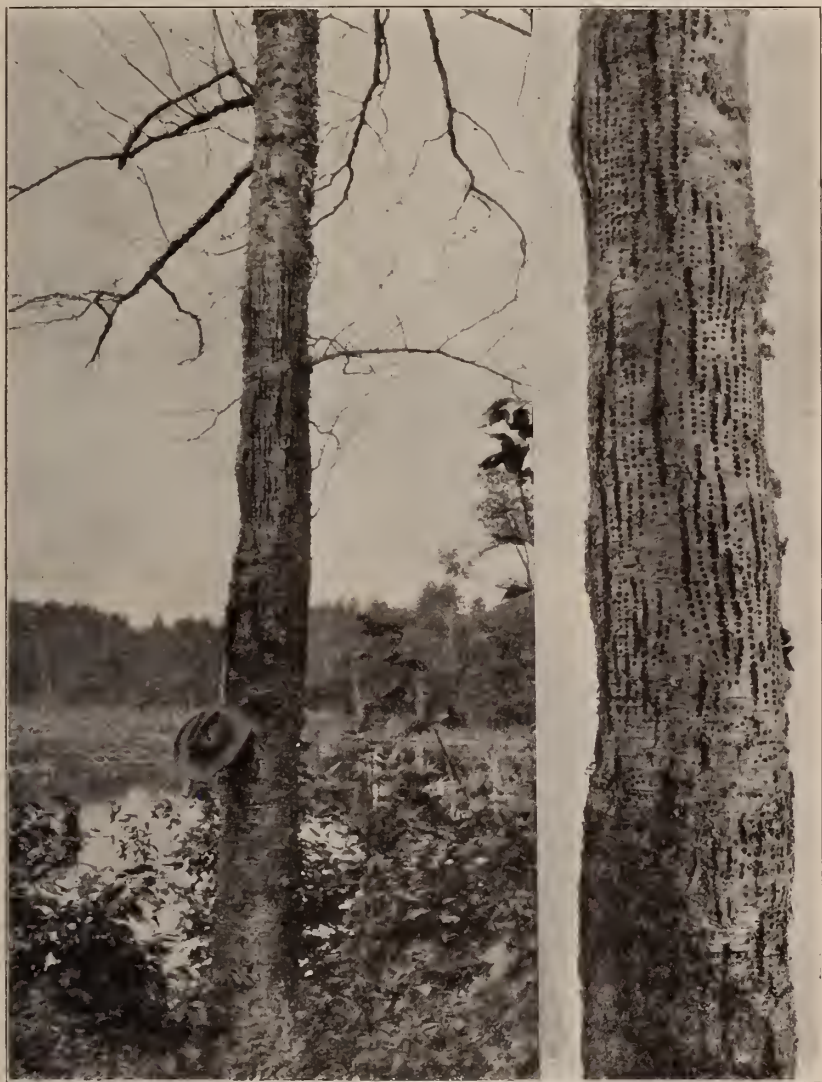


Fig. 158. Large yellow birch south of Forestry Camp. This tree had been killed by Sapsuckers. Photo 1915.

Fig. 159. Section of trunk of yellow birch shown in Fig. 158.

A very interesting example of injury to paper birch (*Betula alba papyrifera*) was found at Camp, behind my tent (1915), on a tree overhanging the lakeshore, and near the large-toothed aspen previously mentioned. This birch had been repeatedly attacked, so that a distinct swelling had been caused in the trunk, as is shown in figures 160 and 161 (cf. McAtee, '11, p. 19). This was the only example of such a marked deformity. At five feet above the ground this tree is 8.5 inches in diameter. The swelled girdled area is within 3.5 feet of the ground, and extends over about one foot of the trunk. At eight feet above the ground is another extensive area, also of about one foot, but only slightly enlarged; at about 12 feet there is an area of about 6 inches in height, and scattered punctures are found on the trunk at various levels.

North of the Camp, along the trail near the lakeshore, and in the cut-over forest, was observed injury on a yellow birch. A tree ten inches in diameter was found about half-girdled, but only about half of the distance had more than a single row of holes. Just north of the line of tents at the Camp were numerous yellow birches, six of which showed considerable work of the Sapsucker. One dead tree at the edge of the lake bluff, about 11.5 inches in diameter at five feet above the ground was almost completely girdled from 5.5 inches from the ground upward for about four feet. The holes are large, many rectangular, and some in the long columns characteristic of extensive injury.

A hemlock about 3.2 inches in diameter had a cluster of about 20 punctures, 5.5 feet above the ground, and higher up among the branches was found an almost complete girdle of holes. Some of the vertical rows were rather regular, as shown in figure 162a. The best example, however, of prolonged and thorough drilling in hemlock was found along a trail south of Camp, just beyond Sucker Brook, in the cut-over area. This tree was six inches in diameter and was thoroughly drilled with thousands of holes. The lower part of the trunk is shown in figure 162b, exhibiting large numbers of fresh, scattered holes, and a few well-defined horizontal rows. Probably the majority of the old holes are of the same character. In a few places the bark had been killed in vertical rows; and where the wound had healed a saw-toothed fringe of old punctures in the bark clearly showed the cause of the original injury. The general appearance of these old scars is shown in the figure. (Cf. McAtee, '11, plate 8, figure 4.) When we consider the number of punctures on this tree we can only wonder at the immense number of chances it involves for this bird to carry fungus spores and thus inoculate trees, since it is definitely known that spores are carried by birds. For our American birds this has only recently been established in the case of the chestnut blight (*Endothia parasitica* Murr.), by Hald and Studhalter ('14). This is a fungus, however, which is not likely to be of much importance in the Adirondacks.

Injury to a beech was observed south of Camp, near the badly injured aspens and yellow birches. The tree was near the lake-



Fig. 160. Paper birch injured by Sapsuckers and showing swelling of trunk.



Fig. 161. A section of the paper birch trunk shown in Fig. 160.

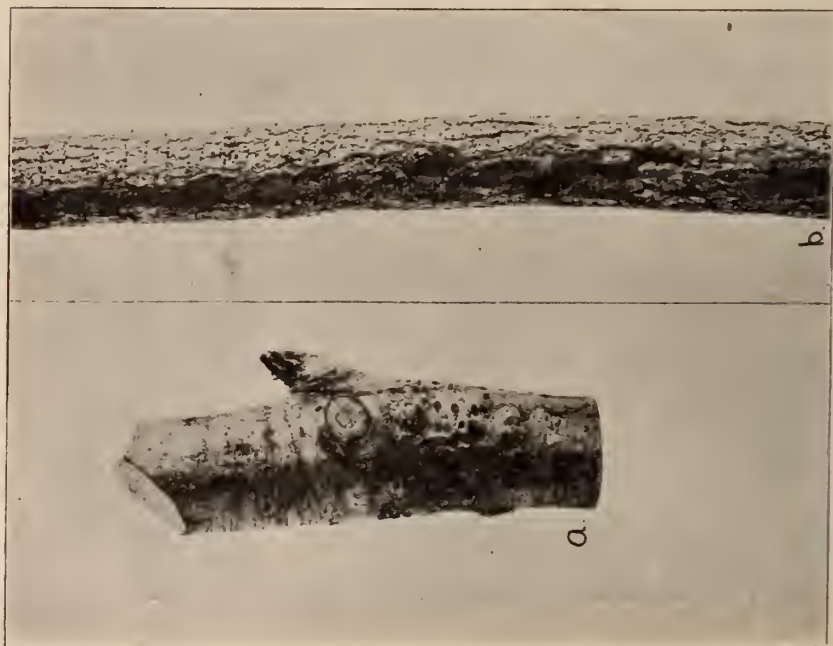


Fig. 162. Hemlock trunks, with numerous borings by Sapsuckers, from hardwood forest near Forestry Camp.



Fig. 163. Beech injured by Sapsuckers, in cut-over forest south of Forestry Camp. Photo 1915.

shore in an open place. Two distinct patches of injury are shown in figure 163, one just above the hat and the other at the upper end of the large scar near the base of the tree. Upon a large tree, felled near the logging camp on Sucker Brook, was found a branch, with the old injured bark showing the characteristic sapsucker-scars, upon which, as the wound healed, it had encroached. A beech log about 7 inches in diameter was found with extensive girdling around about three-quarters of the trunk. The attack had been severe, and large rectangular areas had been bored out in an irregular fashion.

A dead, fungus-infested hard maple was found north of Camp in the cut-over forest — was about half girdled for a vertical distance of nearly six inches. At about six and a half feet above the ground, where the tree had a diameter of three inches, the girdling was complete for a vertical distance of about a foot.

The favorite haunts of these Sapsuckers are of special importance, because they give an idea of the conditions where injury is likely to be the greatest. Bolles ('91, p. 257) states that "their favorite haunts are mixed growths of young birch, larch, hemlock, maple, and white ash bordering water or wet places;" and Eaton ('14, p. 151) remarks: "In the Adirondacks I noticed that they seemed to prefer beeches, birches and maples for nesting sites. The nest is almost always built under the shelter of the forest and not in clearings, as in the case with Red-headed Woodpeckers and Flickers." These limited observations are enough to show that this bird, which is reputed to be the most abundant Woodpecker in the Adirondacks, is exerting considerable influence upon the forests. But to justly estimate this influence it is necessary to include the observations made by others on the activities of this species.

An excellent account of the habits of Adirondack Sapsuckers has been given by Dr. C. Hart Merriam ('79, pp. 3-5) as follows: "In the Adirondack region, during the migrations, they outnumber all the other species of the family together, and throughout the entire summer are second in numbers only to the Hairy Woodpecker (*Picus villosus*). Here they often, in search for insects, strip off the 'shag-bark' from the spruce, and it is no uncommon thing, in passing through these primeval forests, to meet with many large trees thus almost completely denuded of their outer bark for nearly the entire length of the trunk. These trees are very conspicuous objects, and never fail to excite the curiosity of strangers, who are much more willing to believe the existing condition 'due to the ravages of the Black Cock of the Woods (*Hylatomus pileatus*) or Porcupine (*Erethizon dorsatus*)' than to the present innocent-looking species.

"In the central district they really do considerable mischief by drilling holes in the bark of apple, thorn-apple, and mountain-ash trees in such a way as to form girdles of punctures, sometimes two feet or more in breadth (up and down), about the trunks and branches. Whether in like manner they affect trees (excepting occasionally a young elm) pertaining to other genera than the one

(*Pyrus*) to which the above belong, I am unable to say; but the fact of their destroying some of these, notably the apple, and especially in the west, has often been recorded. The holes, which are sometimes merely single punctures, and sometimes squarish spaces (multiple punctures) nearly half an inch across, are placed so near together that, not unfrequently, they cover more of the tree than the remaining bark. Hence, more than half of the bark is sometimes removed from the girdled portions, and the balance often dries up and comes off. Therefore it is not surprising that trees which have been extensively girdled generally die, and mountain ash are much more prone to do so than either apple or thorn apple tree due, very likely, to their more slender stems.

"The motive which induces this species to operate thus upon young and healthy trees, is, I think, but partly understood. It is unquestionably true that they feed, to a certain extent, both upon the inner bark and the fresh sap from these trees, but that the procurement of these two elements of sustenance, gratifying as they doubtless are, is their chief aim in making the punctures I am inclined to dispute. As the sap exudes from the newly made punctures, thousands of flies, 'yellow-jackets,' and other insects congregate about the place, till the hum of their wings suggest a swarm of bees. If, now, the tree be watched, the Woodpecker will soon be seen to return and alight over that part of the girdle which he has most recently punctured. Here he remains, with motionless body, and feasts upon the choicest species from the host of insects within easy reach. Therefore it is my firm belief that their chief object in making these holes is to secure the insects which gather about them.

"Some time ago Mr. C. L. Bagg called my attention to a clump of mountain-ash whose leaves had turned yellow and were fast falling off. Here a pair of these birds, with their young, had established an unfailing food supply, and at almost any time of day several of their dark motionless forms might be seen adhering to the trunks and branches of the young trees. Evidently this had been their headquarters for several seasons, for all the main stems in the cluster were girdled for at least five feet (commencing two or three feet from the ground), and most of the branches of any size were likewise punctured. In making each girdle they work around the trunk, and from below upwards, but they may begin a new girdle below an old one. They make but few holes each day, and after completing two or three remain over the spot for some little time, and as the clear fresh sap exudes and trickles down the bark they place their bill against the dependent drop and suck it in with evident relish,—a habit which has doubtless given rise to the more appropriate than elegant term, 'Sap-Sucker,' by which they are commonly known in some parts of the country. I have several times watched this performance at a distance of less than ten feet, and all the details of the process were distinctly seen, the bird looking at me, meanwhile, 'out of the corner of his eye.' When his thirst is satisfied he silently disappears, and as silently returns again, after a few hours,

to feast upon the insects that have been attracted to the spot by the escaping sap. This bird, then, by a few strokes of its bill, is enabled to secure both food (animal and vegetable) and drink in abundance for an entire day; and a single tree, favorably situated, may suffice for a whole season!"

Frank Bolles ('91, '92) also made very interesting observations on the feeding habits of these birds in New Hampshire, as is shown by the following quotations ('91, pp. 257-258): "The tree most recently tapped was a red maple about 40 feet high and 2 feet through at the butt. The drills made by the Woodpeckers began 18 feet above the ground and formed a girdle entirely around the trunk. The girdle contained over 800 punctures and was about 3 feet in height. In places the punctures or drills had run together causing the bark to gape and show dry wood within. The upper holes alone yielded sap." He concludes (p. 270): "that the Yellow-bellied Woodpecker is in the habit for successive years of drilling the canoe birch, red maple, red oak, white ash and probably other trees for the purpose of taking from them the elaborated sap and in some cases parts of the cambium layer; that the birds consume the sap in large quantities for its own sake and not for insect matter which such sap may chance occasionally to contain; that the sap attracts many insects of various species a few of which form a considerable part of the food of this bird, but whose capture does not occupy its time to anything like the extent to which sap drinking occupies it; that different families of these Woodpeckers occupy different 'orchards,' such families consisting of a male, female and from one to four or five young birds; that the 'orchards' consist of several trees usually only a few rods apart and that these trees are regularly and constantly visited from sunrise until long after sunset, not only by the Woodpeckers themselves, but by numerous parasitical Hummingbirds which are sometimes unmolested, but probably quite as often repelled; that the forest trees attacked by them generally die, possibly in the second or third year of use; that the total damage done by them is too insignificant to justify their persecution in well-wooded regions."

McAtee ('11) has made an elaborate study of the influence of this Woodpecker on trees and wood, and records (p. 53) that: "Twenty-nine of these trees and one vine are known to be sometimes killed and twenty-eight others are much disfigured or seriously reduced in vitality."

The kind of food and drink utilized has been given considerable attention by Beal ('95, '11). Sap, bast and cambium are the main food elements. An examination of the stomach contents of more than 300 birds by Beal ('11) shows that the food is about half-and-half animal and vegetable. The vegetable food consists largely of wild fruit and cambium. In April cambium may amount to nearly half the bulk of the food. It eats a large amount of wild fruit, and thus is an important agent in the scattering of tree and shrub seeds. The tree seeds eaten are those of red cedar, hackberry, sassafras, choke cherry, black cherry and sour gum. Sev-

eral of these are trees mainly southern in range, and do not grow in the northern breeding area. Beal (l. c., p. 30) says "Poison-ivy seed was contained in seven stomachs and poison sumac in one, so the Sapsucker does little harm by distributing the seed of these noxious plants." Ants form the largest part, or 69 per cent, of the animal food, and about one-third of all the food; the remainder of the animal food consists of insects. Bolles ('92) experimented with young birds, feeding them on maple-sugar syrup to see if they could live solely on such a diet. Although these birds secured some insect food they lived about four months and died with diseased livers, showing that syrup was not a normal diet.

To evaluate the ant food of the Sapsucker it is desirable to consider the role of ants in the forest, as expressed by Wheeler ('10, p. 8), who says: "Eminent economic entomologists, like Taschenberg and Ratzeburg, who have studied the ants in the German forest preserves, are of the opinion that they are highly beneficial. A German law, passed in 1880, punishes with a fine of 100 marks or a month's imprisonment any person who collects the cocoons of the fallow ant, *Formica rufa*, or wantonly disturbs its nests in the forest preserves. * * * The greatest usefulness of ants, which lies in their power to hasten the decomposition of organic substances, is easily overlooked or belittled, like all the great forces which act very gradually but incessantly. * * * (p. 9): The activities of ants in excavating their nests have a very useful aspect. Most of the species, especially in temperate latitudes, nest in the ground, and many of them in so doing are obliged to comminute and bring to the surface, often from a depth of several feet, considerable quantities of subsoil. This is spread over the surface either by the elements or by the ants themselves and exposed to the sun and atmosphere. The burrows, moreover, quickly conduct air and moisture into the deeper recesses of the soil. Thus the ants act on the soil like the earthworms, and this action is by no means inconsiderable, although as yet no one has studied it in detail." The conversion of plant remains, leaves and wood into humus and soil serves in addition to its enrichment as an important protective factor in the forest, by rapidly converting this highly inflammable material into a less inflammable state, and thus aiding in fire protection. Of course, there are many animals, besides ants, which have this influence on the forest.

In August, 1916, an effort was made to learn something of the relation of Sapsuckers to the ants which were commonly observed crawling on the trunks of the trees frequented by these birds. The materials were later sent to Dr. W. M. Wheeler, Harvard University, who kindly made the determinations. On an aspen sucker attending plant lice was found (No. 11) *Formica fusca*, and crawling on the trunks were (No. 27) *Camponotus herculeanus ligniperda noveboracensis* and *Formica fusca*.

On August 21, I observed a Sapsucker crawling about over a large white pine, apparently picking up insects occasionally from the bark. When it flew away I found on the bark near where the

Sapsucker had been feeding several large black ants (No. 18), which proved to be *Formica fusca*. At the same time fresh moist excrement was found on a twig adjacent to where the Sapsucker had been seen to void. On examining this with a hand lens I saw it was composed mainly of the chitinous fragments of ants, which proved to be *Formica fusca*. I then revisited the aspens which had been resorted to so regularly and searched about the base of the trees for further evidence from the excrement. Several samples were taken, some (Nos. 20, 23, 28, and 30) contained *Camponotus herculeanus pennsylvanicus*, and another (No. 29) contained *Formica fusca* and *Lasius niger americanus*. I think this direct and indirect information is harmonious and clearly indicates that ants are an important element in the diet of the Sapsucker at this season of the year. Beal ('11, p. 29) says concerning the food of this bird: "Ants amount to 34.31 per cent of the whole food, or 69 per cent of the animal part. They are evidently favorite food, being eaten quite regularly through the year, although the months from May to August, inclusive, show the highest percentages, averaging over 68 per cent." (Cf. also Bequaert '22, p. 307).

All of the species of ants mentioned above, *Formica fusca* (Linn.); *Camponotus pennsylvanicus* (De G.), *Camponotus ligniperda noveboracensis* (Fitch), and *Lasius niger americanus* (Emery), are known to make nests in rotten wood. The only species known to do serious harm in forests is *Camponotus pennsylvanicus*, the common carpenter ant, which tunnels in solid as well as rotten wood. These ants become pests about buildings and are also recorded injuring telephone poles in woodlands. All of these species tend to convert woody tissue into humus, and thus have a general beneficial influence in forests. Recently Hawley and Record ('16) have expressed their suspicions of injury to young white pine about ant nests by *Formica exsectoides* Forel (authority for the determination of the species not given). (Cf. Haasis '17). Very recently Pierson ('22) has made a very careful study of this ant, confirming the damage done to trees and suggesting methods for its control. In one case *Formica fusca* (Linn.) was apparently involved. It is very evident that until ants are studied in greater detail, under diverse conditions, we are not in a position to estimate safely their ecologic and economic rôle in forests. Any such investigation should give special attention to the conversion by ants of wood into humus as a method of reducing the fire hazard.

FERMENTED SAP AND SAPSUCKERS

The sap drinking habit of Sapsuckers has led to some interesting comments as to the intoxicating influence of fermented sap on these birds. Thus Bendire ('95, p. 85) states: "That it should be fond of the sweet sap of trees does not surprise me, as this contains considerable nourishment, and likewise attracts a good many insects, which the birds eat, but it is not so easy to account for its especial predilections for the sap of mountain ash, which

has a decidedly bitter taste, and I believe possesses intoxicating properties, unless it be taken for the latter purpose; and the fact that after drinking freely of the sap of this tree it may often be seen clinging to the trunk for hours at a time, as if stupefied, seems to confirm this view." And, similarly, Eaton ('14, pp. 150-151) remarks: "One frequently finds mountain ash trees, pines, black spruces, ironwoods, and birches so weakened by the boring of this species that they never recover from his attack. * * *

As the spring advances and the weather becomes warm, the sap begins to ferment. I suspect this is the reason that the Sapsucker is so frequently found stupefied by feeding on too great an abundance of the liquid. On several occasions I have seen a Sapsucker so gorged with fermented sap that he allowed himself to be picked up in the hand and I have seen one alight on the clothing of a bird-student and climb up his outstretched arm without seeming to realize that he was on a man instead of a tree. It is evident they become tipsy on the sap in the same manner that thrushes frequently become stupefied by feeding upon fermented fruit."

The following observations by Prof. A. G. Whitney, of The New York State College of Forestry, are of interest. He informs me that he saw Sapsuckers at work on gray birches (*Betula populi-folia*) at Hanover, N. H., and states that: "The trees were bled steadily and thoroughly and during the daytime the birds drank all the flow of sap; but at night much of it flowed down over the trunk where it fermented during the heat of the day and was wasted. This fermenting was obvious by the appearance of the sap, and the odor was unmistakable. The Sapsuckers were never observed to drink the fermenting sap but were seen to suck up only the fresh liquid from the upper openings."

This reputation for tipling has led to an interesting and amusing article recently published by Johnson ('16), in which he records the opinions of some bird-students on this subject. Evidently further careful field work and chemical study is needed to clear up this problem. It is significant that Beal, who has devoted several years to the study of the food of woodpeckers, does not attempt to discuss the subject of intoxication. Possibly he discredited it. An effort has been made to learn something of the chemical basis for the formation of alcohol in the fermenting sap. In reply to my inquiry the following opinion was given by Dr. H. A. Edson, Physiologist of the Bureau of Plant Industry, United States Department of Agriculture, who has made extensive investigations of the micro-organisms of maple sap, and who wrote to me, under date of July 3, 1916, as follows: "Indeed I am not aware that we have any exact information regarding this question. I am personally inclined to question whether Sapsuckers become intoxicated as a result of drinking fermenting sap. In my investigations in Vermont, I found alcohol production to be a very minor occurrence in the decomposition of sap. The majority of the micro-organisms which I isolated and studied were not producers of ethyl alcohol. None of the yeasts occurring spontaneously in the regions where I

worked produced ethyl alcohol. It is, of course, true that spontaneous fermentation of maple sap results in the production of sap-beer. However, so far as my observation goes, yeast is always added to partially concentrated sap when it is desired to produce this beverage. Some 30 years of observation in the maple-orchards of Vermont lead me to think it is altogether probable that evaporation removes the small quantities of alcohol that may be formed too rapidly to permit of any appreciable percentage in the rather small quantities of sap which may be found in crevices.

"Analyses of decomposing sap show that the sucrose content is considerably diminished as the decomposition becomes pronounced. Invert sugars increase in quantity and are, of course, further decomposed or consumed by the continued growth of moulds and bacteria. I would not care to hazard a guess as to whether the peculiar behavior of sapsuckers who have partaken of fermented maple sap is the result of the beverage or any of its component parts. Personally, I have never seen the indications of intoxication. There may be something in your suggestion that sapsuckers fed upon sucrose contract a sort of diabetes resulting in their death. Of this, however, I know nothing."

Mr. C. W. Carpenter, also of the Bureau of Plant Industry, U. S. Dept. of Agriculture, who has also made a special study of the fermenting sap of the sugar maple, says, in a letter dated Feb. 28, 1916: "I recall no determination of alcohol produced in maple sap through the action of microorganisms. Although the sucrose is inverted to some extent through the action of microorganisms, and the content of invert sugar ordinarily is increased as the sap spoils, I am not in a position to say how much, if any ethyl alcohol is produced. Theoretically it would not be very much from a 3 per cent sugar solution. Such small amounts as were produced conceivably would evaporate or be continually diluted by the inflowing sap, as there are no places on trees where a large amount of sap could accumulate and remain for any length of time. I have never seen the reference to sapsuckers becoming drunk after imbibing such fermented sap. I believe it more likely that if this happens it is a case of autointoxication and not over indulgence in alcohol."

Dr. A. Hugh Bryan, formerly of the Bureau of Chemistry of the U. S. Department of Agriculture and now Supervising Chemist with Arbuckle Brothers of New York, writes me as follows in a letter dated March 28, 1916: "The sap of the maple tree contains anywhere from 0.5 to 3 per cent of sugars, and during the manufacturing season these sugars are principally sucrose. It might be possible that there is a fermentation on warm days of sap that exudes through the bark with the production of alcohol. It is noted that the sap sours very easily, although I have not seen any references to the production of alcohol, by this souring." Still further information has been received from Dr. C. S. Hudson, Chemist in Charge of the Carbohydrate Laboratory of the Bureau of Chemistry of the U. S. Department of Agriculture, in a letter dated March 31, 1916: "With regard to the formation of alcohol from maple sap,

it may be stated that the average sugar content of the sap is about 3 per cent. Assuming that the theoretical yield of alcohol could be obtained from this, it would amount to $1\frac{1}{2}$ grams alcohol or a solution containing $1\frac{1}{2}$ grams alcohol in 100 cc.

"However, it is not believed that alcohol would be produced from maple sap under ordinary conditions. Very little of the sap that may run down the side of the tree collects in the interstices of the bark, as it dries up rather quickly, and while the sap on the surface of the tree may become slightly 'sour' late in the season, it is thought that it would dry up before alcoholic fermentation could take place. It should be noted that early in the season it is usually too cold for fermentation to take place and late in the season the air is warm enough to dry up the sap very quickly.

"The term 'sour' used above serves to indicate a peculiar condition of the sap that is caused by the growth of micro-organisms and should be differentiated from the alcoholic fermentation that may occur through the decomposition of sucrose, and subsequent change of the invert sugar formed to alcohol, when a quantity of the sap is kept for some time at a warm temperature."

At Syracuse in April, 1917, Sapsuckers were very active on several kinds of trees. On the trunk of an ironwood (*Ostrya virginiana*) a pink slime was found growing on the tree where the sap flowed. This Dr. L. H. Pennington kindly examined and reported to be "Principally *Fusarium* sp., probably *F. Zeae* (West) Sacc.," and "some wild yeast (*Saccharomyces* sp.) and Bacteria." He adds: "My observations lead me to think that this or a similar slime-flux *Fusarium* has a perfect stage belonging to the genus *Nectria*." The plants and animals that live upon exuding sap of trees would make a special problem worthy of detailed investigation as a biochemical and ecological problem.

SUMMARY AND CONCLUSIONS

In concluding this discussion of the Sapsucker it is evident that this is a woodpecker which is capable of exerting considerable influence upon trees and forests. As the most abundant woodpecker in the Adirondacks it deserves careful study and a fair trial before condemnation. It habitually injures or kills a large number of trees, including some of slight and others of much economic value. The destruction of some young aspens and birches only amounts to a slight thinning, and may be beneficial to more valuable young trees growing under them, but the killing and injury to older trees is generally harmful. The large diet of wild fruit makes it capable of materially aiding the reforestation of wild burned lands, and in making conditions on such lands more favorable for deer,—as in the case of other fruit-eating birds. It thus also aids in the conservation of soil and water. That it eats relatively few of the fruits of poisonous plants is also favorable. In a managed forest it would plant "weed" trees, but this is not much of a present-day problem. Of course, other birds do the same kind of work, and for this

reason if the Sapsuckers were reduced in number other species might be substituted. The marked preference for ants, which destroy much wood but aid in soil formation, must be given due credit. This is a good example showing how difficult it is correctly to estimate the economic value of many animals. Certain chemical and physiological considerations do not favor the idea that sour or fermented sap causes drunkenness in Sapsuckers.

The preceding discussion shows that there are many and marked evidences of the influence of birds upon the forest vegetation of the Adirondacks. This influence is on the whole very valuable to both the State and to private individuals, particularly because of the aid which it gives in hastening reforestation on burned lands. This aids in the conservation of soil and water, and makes the conditions more favorable for game and fish, and, last but not least, makes the region much more attractive to summer visitors, as few persons care to visit burned desolate areas.

Foresters are coming to agree that in the Adirondacks large areas should be permanent protection forests, to conserve soil and water, and where no cutting of trees should be allowed; these to remain wild forests, composed largely of spruce. In what manner do birds influence these forests? Still other large tracts ought to be preserved as natural "monuments," and as a wild preserve for the preservation of sample areas of wild plants and animals for educational and scientific purposes. These areas should include the main kinds of native vegetation, mixed hardwood forests, and swamps, not already included within the protection-forests, and should be supplementary to them. These should be preserved for their scenic, educational, scientific value, and for the scientific study of certain forest problems. What is the relation of birds to such forests? A third kind of forest land includes that which should be managed to produce the best possible crop of commercial forest. This might include spacious areas away from the larger streams and lakes. This part should be so managed as to pay much toward the upkeep of the forest, fish and game interests, as well as being a playground, and should be so conducted that the ordinary citizen may easily enjoy it. What is the relation of birds to this kind of a forest?

It is hoped that in the future woodland birds will be more thoroughly investigated from the standpoint of their relation to forests broadly considered. Such investigations should be detailed and include a careful study of the life activities of the birds, including their food, nesting habits, enemies and relative abundance in wild and modified forests under every possible condition, as in clearings, in lumbered forests, in all stages of the different systems of reforestation, and under the various systems of forest management. Further similar studies should be made of forested game preserves and the various systems of management of large forested parks and other woodlands. In given conditions, say five acres, how many birds normally live, how can their numbers be increased or decreased, and what desirable changes can be made in such a bird community? Strange as it may seem, not a forest-inhabiting species

of bird in North America has been thoroughly studied according to such a program, and thoroughly related to forest practice. Here is an immense field of work for properly trained men who wish to put this phase of forestry upon a thoroughly sound, scientific, and economic basis.

SELECTED REFERENCES

BEAL, F. E. L.

- 1893. Food Habits of the Cedar-bird (*Ampelis cedrorum*). Ann. Rep. U. S. Secy. of Agr. for 1892, pp. 197-200.
- 1906. Birds as Conservators of the Forest. Rep. N. Y. Forest, Fish and Game Comm. 1902-03, pp. 236-274.
- 1911. Food of the Woodpeckers of the United States. U. S. Dept. Agr., Biol. Surv., Bull. No. 37, pp. 1-64.

BENDIRE, C.

- 1895. Life Histories of North American Birds, from Parrots to the Grackles, with Special Reference to their Breeding, Habits and Eggs. Smithsonian Institution, Special Bulletin.

BEQUAERT, J.

- 1922. The Predaceous Enemies of Ants. Bull. Amer. Mus. Nat. Hist., Vol. 45, pp. 271-331.

BOLLES, FRANK.

- 1890. Young Cedar-birds and Great Crested Flycatchers in Captivity. The Auk, Vol. 7, p. 290.
- 1891. Yellow-bellied Woodpeckers and their Uninvited Guests. The Auk, Vol. 8, pp. 256-270.
- 1892. Young Sapsuckers in Captivity. The Auk, Vol. 9, pp. 109-119.

EATON, E. H.

- 1914. Birds of New York. Mem. 12, N. Y. State Mus., Part 2, pp. 1-543.

ECKSTORM, F. H.

- 1901. The Woodpeckers. Pp. 1-131. Boston.

FROTHINGHAM, E. H.

- 1915. The Northern Hardwood Forest; its Composition, Growth and Management. U. S. Dept. Agr., Bull. 285, pp. 1-80.

GAYLORD, F. G.

- 1915. The Effect of Conservative Lumbering on Game. Bull. N. Y. State Forestry Assoc., Vol. 2, pp. 27-29.

HAASIS, FERDINAND W.

- 1917. Dying of Young Pines in Circles about Anthills. Jour. Forestry, Vol. 15, No. 6, pp. 763-769.

- HAWLEY, R. C., and RECORD, S. J.
1916. Do Ants Kill Trees About their Colonies? *Amer. Forestry*, Vol. 22, pp. 685-686.
- HEALD, F. D. and STUDHALTER, R. A.
1914. Birds as Carriers of the Chestnut-blight Fungus. *U. S. Dept. Agr., Jour. Agr. Research*, Vol. 2, pp. 405-422.
- HERRICK, F. H.
1902. *The Home Life of Wild Birds*. Pp. 1-148. New York.
- JOHNSON, BURGESS.
1916. From the Note-book of an Un-naturalist. *Harper's Magazine*, Vol. 132, pp. 260-266.
- JUDD, S. D.
1901. The Food of Nestling Birds. *Yearbook U. S. Dept. Agr. for 1900*, pp. 411-436.
- MCATEE, W. L.
1910. Plants Useful to Attract Birds and Protect Fruit. *U. S. Dept. Agr. Yearbook for 1909*, pp. 185-196.
1911. Woodpeckers in Relation to Trees and Wood Products. *U. S. Dept. Agr., Biol. Surv. Bull. No. 39*, pp. 1-99.
1914. How to Attract Birds in Northeastern United States. *U. S. Dept. Agr., Farmers Bull. No. 621*, pp. 1-15.
- MERRIAM, C. H.
1879. Remarks on Some of the Birds of Lewis County, Northern New York. *Bull. Nutt. Ornith. Club.*, Vol. 4, pp. 1-6.
- PEARSON, G. A.
1914. The Role of Aspen in the Reforestation of Mountain Burns in Arizona and New Mexico. *Plant World*, Vol. 17, pp. 249-260.
- PIERSON, H. B.
1922. Mound-Building Ants in Forest Plantations. *Jour. Forestry*, Vol. 20, No. 4, pp. 325-336.
- STERLING, E. A.
1902. Adirondack Birds in their Relation to Forestry. *Forestry Quart.*, Vol. 1, pp. 18-25.
- WEIGLE, W. G. and FROTHINGHAM, E. H.
1911. The Aspens; Their Growth and Management. *U. S. Dept. Agr., Forest Service Bull. No. 93*, pp. 1-35.
- WHEELER, W. M.
1910. *Ants: Their Structure, Development and Behavior*. Pp. 1-663. New York.

RELATION OF MIGRATORY BIRDS TO FORESTS, THE
STATE AND THE NATION

"The necessity of the preservation of bird life to the continuance of the life of our national forests, and of the preservation of our agricultural resources or, in other words, the dependence of forest and plant life upon bird life, is thus demonstrated."

LOUIS MARSHALL.

Brief to Supreme Court of the United States,
October Term, 1919, No. 609, p. 41.

"On December 8, 1916, a treaty between the United States and Great Britain was proclaimed by the President. It recited that many species of birds in their annual migrations traversed many parts of the United States and of Canada, that they were of great value as a source of food and in destroying insects injurious to vegetation, but were in danger of extermination through lack of adequate protection. * * * Wild birds are not in the possession of anyone; and possession is the beginning of ownership. The whole foundation of the State's rights is the presence within their jurisdiction of birds that yesterday had not arrived, tomorrow may be in another State, and in a week a thousand miles away.

"Here a national interest of very nearly the first magnitude is involved. It can be protected only by national action in concert with that of another power. The subject matter is only transitorily within the State and has no permanent habitat therein. But for the treaty and the statute there soon might be no birds for any powers to deal with. We see nothing in the Constitution that compels the Government to sit by while a food supply is cut off and the protectors of our forests and our crops are destroyed. It is not sufficient to rely upon the States. * * * We are of opinion that the treaty and statute must be upheld."

JUSTICE HOLMES.

Decree, Supreme Court of the United States,
October Term, No. 609, 1919.

THE SUMMER BIRDS OF THE ADIRONDACKS IN FRANKLIN COUNTY, N. Y.

BY THEODORE ROOSEVELT, JR., AND H. D. MINOT.

The following catalogue (written in the mountains) is based upon observations made in August, 1874, August, 1875, and June 22d to July 9th, 1877, especially about the Saint Regis Lakes, Mr. Minot having been with me, only during the last week of June. Each of us has used his initials in making a statement which the other has not verified.

THEODORE ROOSEVELT, Jr.

The general features of the Adirondacks, in those parts which we have examined, are the many lakes, the absence of *mountain*-brooks, the luxuriant forest-growth (the taller deciduous trees often reaching the height of a hundred feet, and the White Pines even that of a hundred and thirty), the sandy soil, the cool, invigorating air, and both a decided wildness and levelness of country as compared with the diversity of the White Mountain region.

The *avifauna* is not so rich as that of the latter country, because wanting in certain "Alleghanian" birds found there, and also in species belonging especially to the Eastern or North-eastern Canadian fauna. Nests, moreover, seem to be more commonly inaccessible, and rarely built beside roads or wood-paths, as they often are in the White Mountains. M.

1. **Robin.** *Turdus migratorius* (Linnæus). Moderately common. Sometimes found in the woods.
2. **Hermit Thrush.** *Turdus Pallasi* (Cabanis). Common. Sings until the middle of August (R.).
3. **Swainson's Thrush.** *Turdus Swainsoni* (Cabanis). The commonest thrush.
4. **Cat-bird.** *Mimus Carolinensis* (Linnæus). Observed beyond the mountains to the northward, near Malone.
5. **Blue Bird.** *Sialia sialis* (Linnæus). Common near Malone.
6. **Golden-crowned "Wren."** *Regulus satrapa* (Lichten.). Quite common; often heard singing in June.
7. **Chickadee.** *Parus atricapillus* (Linnæus). Rather scarce in June. Abundant in August (R.).
8. **Hudsonian Chickadee.** *Parus Hudsonicus* (Forster). Found in small flocks at Bay Pond in the early part of August (R.).
9. **Red-bellied Nuthatch.** *Sitta Canadensis* (Linnæus). Common. The White-bellied Nuthatch has not been observed here by us.
10. **Brown Creeper** *Certhia familiaris* (Linnæus). Common.
11. **Winter Wren.** *Troglodytes hyemalis* (Vieillot). Moderately common.

12. **Blue Yellow-backed Warbler.** *Parula Americana* (Linnæus). Very common. The Black and White Creeper we have not seen here.

13. **Nashville Warbler.** *Helminthophaga ruficapilla* (Wilson). Not common.

14. ? **Tennessee Warbler** *Helminthophaga peregrina* (Wilson).

15. **Yellow Warbler.** *Dendroeca aestiva* (Gmelin). Common near Malone

16. **Black-throated Green Warbler.** *Dendroeca virens* (Gmelin). Common.

17. **Black-throated Blue Warbler.** *Dendroeca caerulescens* (Linnæus). Common.

18. **Orange-throated Warbler.** *Dendroeca Blackburnia* (Gmelin). Common. Its song has several rather misleading variations.

19. **Yellow-rumped Warbler.** *Dendroeca coronata* (Linnæus). Common in August (R.). Summer-resident in the White Mountains (M.).

20. **Black and Yellow Warbler.** *Dendroeca maculosa* (Gmelin). Not common.

The following other *Dendroecæ* are summer-residents in the White Mountains: Prairie Warbler, accidental; the Chestnut-sided, Bay-breasted, Black-poll'd, and Pine Warblers, all rare (M.).

21. **Golden-crowned "Thrush."** *Siurus auricapillus* (Linnæus). Quite common.

22. **Water "Thrush."** *Siurus naevius* (Boddaert). Rare summer-resident (R.).

23. **Maryland "Yellow-throat."** *Geothlypis trichas* (Linnæus). Hardly common. Very common in the White Mountains (M.).

24. **Mourning Warbler.** *Geothlypis Philadelphica* (Wilson). Locally not uncommon.

25. **Canada "Flycatcher."** *Myiodiocetes Canadensis* (Linnæus). Less common than in the White Mountains, where the Redstart also is found, even at Bethlehem (M.).

26. **Scarlet Tanager.** *Pyranga rubra* (Linnæus). Two pairs found in June near the Upper Saint Regis Lake.

27. **Barn Swallow.** *Hirundo horreorum* (Barton).

28. **Cliff Swallow.** *Petrochelidon lunifrons* (Say). Seen near Malone.

29. **White-breasted Swallow.** *Tachycinetes bicolor* (Vieillot). Common, and met with far from any buildings.

30. **Bank Swallow.** *Cotyle riparia* (Linnæus). Rather rare.

31. **Purple Martin.** *Progne subis* (Linnæus). One seen at Malone.

32. **Cedar-bird.** *Ampelis cedrorum* (Vieillot). Common.

33. **Red-eyed Vireo.** *Vireo olivaceus* (Linnæus). Very common.

34. **Solitary Vireo.** *Vireo solitarius* (Wilson). Very common. The Warbling Vireo has not been observed here by us.

35. **Purple Finch.** *Carpodacus purpureus* (Gmelin). Common.

36. **Red Crossbill.** *Loxia curvirostra* (Linnæus). Not rare. The male often sings somewhat like a Purple Finch from the top of a tall dead tree. The White-winged Crossbill we have not seen here.

37. **Goldfinch.** *Chrysomitris tristis* (Linnæus). Common. Less so than in the White Mountains (M.).

38. **Siskin.** *Chrysomitris pinus* (Wilson). One specimen got, August 27th, 1874 (R.). Probably breeds.

3

39. Savannah Sparrow. *Passerculus savanna* (Wilson). Apparently rare.

40. Bay-winged Sparrow. *Poæcetes gramineus* (Gmelin). Common.

41. Song Sparrow. *Melospiza meloda* (Wilson). Common. Much less so than in the White Mountains (M.).

42. Swamp Sparrow. *Melospiza palustris* (Wilson). Two or three were found in the wet ground, covered with very low shrubs, which borders the stream connecting Upper Saint Regis and Spitfire Lakes. Perhaps not found in the White Mountains (M.).

43. Chipping Sparrow. *Spizella socialis* (Wilson).

44. ?Field Sparrow. *Spizella pusilla* (Wilson).

45. White-throated Sparrow. *Zonotrichia albicollis* (Gmelin). Common.

46. Snow-bird. *Junco hyemalis* (Linnæus). Common. Less so than in the White Mountains, at least than in the northern and western parts, where the Canadian fauna is most marked (M.). This opportunity is taken for mentioning that the Rose-breasted Grosbeak, *Goniaphea Ludoviciana* (Linnæus), was seen in July, 1875, on Mount Mansfield, Vt., and in July, 1877, in Essex County, New York (R.).

47. Bobolink. *Dolichonyx oryzivorus* (Linnæus). Several seen, August, 1874 (R.).

48. Cow-bird. *Molothrus ater* (Boddaert). Rare.

49. Red-winged Blackbird. *Agalæus phæniceus* (Linnæus). By no means abundant.

50. Rusty Blackbird. *Scolecophagus ferrugineus* (Gmelin). Two or three seen in June (M.).

51. Crow Blackbird. *Quiscalus purpureus* (Bartr.) var. *æneus* (Bd.). Neither rare nor common. The Baltimore Oriole is not seen here.

52. Raven. *Corvus corax* (Linnæus). A pair were observed at Lake Farnsby, jr., August, 1874 (R.).

53. Crow. *Corvus Americanus* (Audubon). Comparatively uncommon.

54. Canada Jay. *Perisoreus Canadensis* (Linnæus). Locally common in the thicker woods.

55. Blue Jay. *Cyanurus cristatus* (Linnæus). Moderately common.

56. King-bird. *Tyrannus Carolinensis* (Linnæus). Common.

57. Great Crested Flycatcher. *Myiarchus crinitus* (Linnæus). Very rare.

58. Pewee. *Sayornis fuscus* (Gmelin).

59. Wood Pewee. *Contopus virens* (Linnæus).

60. Olive-sided Flycatcher. *Contopus borealis* (Richardson). Not uncommon.

61. Traill's Flycatcher. *Empidonax Trailli* (Audubon). Rare.

62. Least Flycatcher. *Empidonax minimus* (Baird). Strikingly common, and much in tree-tops.

63. Yellow-bellied Flycatcher. *Empidonax flaviventris* (Baird). Rather rare, and a frequenter of shrubbery.

64. Night "Hawk." *Chordeiles Virginianus* (Gmelin).

65. Whippoorwill. *Antrostomus vociferus* (Wilson). One heard early in July (R.).

66. Chimney Swift. *Chatura pelagica* (Linnæus). Common, and often met with in the wilds.

67. Hummingbird. *Trochilus colubris* (Linnæus). Rare; lives in the woods.

68. **Kingfisher.** *Ceryle alcyon* (Linnæus).
69. **Cuckoo.** *Coccyzus erythrophthalmus* (Wilson)?]. Twice heard
70. **Pileated Woodpecker.** *Hylotomus pileatus* (Linnæus). Rare, but found in the backwoods (R.).
71. **Hairy Woodpecker.** *Picus villosus* (Linnæus). Very common; with a great variety of notes, some of which are indistinguishable from those of the *Picoides*.
72. **Downy Woodpecker.** *Picus pubescens* (Linnæus). Once seen in June, and common in August (R.).
73. **Black-backed Woodpecker.** *Picoides arcticus* (Swainson). Common; second in numbers to the Hairy only.
74. **Banded-backed Woodpecker.** *Picoides Americanus* (Brehm). Much less common than the preceding.
75. **Yellow-bellied Woodpecker.** *Sphyrapicus varius* (Linnæus). Quite common.
76. **Golden-winged Woodpecker.** *Colaptes auratus* (Linnæus).
77. **Barred Owl.** *Syrnium nebulosum* (Forster). One shot in August, 1875 (R.). Probably not very rare.
78. **Great Horned Owl.** *Bubo Virginianus* (Gmelin). Common in wild parts (R.). There are doubtless other kinds of owls here as summer-residents.
79. **Goshawk.** *Astur atricapillus* (Wilson). Found in June.
80. **Cooper's Hawk.** *Nisus Cooperi* (Bonaparte).
81. **Sharp-shinned Hawk.** *Nisus fuscus* (Gmelin). The Sparrow Hawk and the Red-shouldered Buzzard we have not seen here.
82. **Red-tailed Buzzard.** *Buteo borealis* (Gmelin).
83. **Broad-winged Buzzard.** *Buteo Pennsylvanicus* (Wilson). One shot August 24th, 1874 (R.).
84. **Bald Eagle.** *Haliaeetus leucocephalus* (Linnæus). Rare, but seen at least once (R.). The Golden Eagle probably occurs here.
85. **Fish Hawk.** *Pandion haliaeetus* (Linnæus). Rare, but certainly breeds here (R.).
86. **Wild Pigeon.** *Ectopistes migratorius* (Linnæus). Undoubtedly to be found here at times.
87. **Canada Grouse.** *Tetrao Canadensis* (Linnæus). In some parts quite plentiful (R.).
88. **Ruffed Grouse.** *Bonasa umbellus* (Linnæus). Not uncommon (R.).
89. **Woodcock.** *Philohela minor* (Gmelin). In July, one was shot at Paul Smith's; none of the inhabitants knew what it was, or had ever seen another (R.).
90. **Spotted Sandpiper.** *Tringoides macularius* (Linnæus).
91. **Great Blue Heron.** *Ardea herodias* (Linnæus). Rare.
92. **Bittern.** *Botaurus mugilans* (Bartram). Occasional (R.).
93. **Black Duck.** *Anas obscura* (Gmelin). Breeds (R.).
94. **Wood Duck.** *Ex sponsa* (Linnæus). Breeds (R.).
95. **Merganser.** *Mergus [serrator]* (Linnæus)?]. Breeds (R.).
96. **Loon.** *Colymbus torquatus* (Brünnich). Rare, but in 1876 common (R.). Grebes have been seen in August; species uncertain (R.).
97. **Herring Gull.** *Larus argentatus* (Brünnich). Rare Breeds (R.).

CURRENT STATION NOTES

ADIRONDACK BIRDS

This number of the *Bulletin* is devoted to the birds of the western Adirondack region. The modern view of the relation of birds to the forest is well expressed by the quotations given on p. 520.

That one of the earliest writings of Theodore Roosevelt was a joint paper with his friend H. D. Minot, on "The Summer Birds of the Adirondacks in Franklin County, N. Y.," will surprise many who have not realized how much at heart Roosevelt was a wild life enthusiast. The paper was written when Roosevelt was 17 years old and as he states "in the mountains." In the "Bulletin of the Nuttall Ornithological Club," Vol. 3, p. 36, 1878, then the leading ornithological publication in America, reference was made to this paper as follows by Dr. J. A. Allen: "Messrs. Roosevelt and Minot have published a very acceptable list of the summer birds of the Adirondacks, embracing ninety-seven species, with short notes respecting their abundance,—the first list known to us of the summer birds of this ornithologically little-explored region.—J. A. A."

In Mrs. Corinne Roosevelt Robinson's very interesting volume, "My Brother Theodore Roosevelt," on pages 100-101, she refers to this paper and reproduces the first page of the paper. Its rarity and inaccessibility has suggested that it be reproduced exactly, with the assurance that it will be heartily welcomed by many.

ADIRONDACK WILD LIFE

In addition to the investigations of Adirondack birds the Station made a study of the status of beaver in Hamilton and Herkimer Counties, the results of which were published in the preceding number of the *Bulletin*. The demand for this report has been so great that the small edition for general distribution was exhausted within three months after its appearance. This study of the beaver should be extended throughout the Adirondacks. It is known that the beaver influences both deer and trout, and other animals of the forest. Again we are reminded of the urgent need of an intensive study of the deer. It is indeed surprising that an animal of so much interest and importance should receive relatively slight study in the Adirondacks.

During the past summer (1922) Mr. Alexander Macdonald, Commissioner, New York State Conservation Commission, invited the cooperation of the Roosevelt Station in a study of the trout of the vicinity of Cranberry Lake in the Western Adirondacks. There exists considerable diversity of opinion among the residents as to

the best policy with regard to the trout in that vicinity. The large lake and the inflowing Oswegatchie River make an unusual combination of conditions which are particularly favorable for the production of large trout. In fact, the region is reported to include the best trout waters in the Adirondacks, and naturally their importance justifies most careful study.

A field party from the Station consisting of four men made a preliminary reconnaissance of the situation during September with the idea of preparing plans for continuing the study in the spring.

THE ROOSEVELT WILD LIFE MEMORIAL

As a State Memorial

The State of New York is the trustee of this wild life Memorial to Theodore Roosevelt. The New York State College of Forestry at Syracuse is a State institution supported solely by State funds, and the Roosevelt Wild Life Forest Experiment Station is a part of this institution. The Trustees are State officials. A legislative mandate instructed them as follows:

"To establish and conduct an experimental station to be known as 'Roosevelt Wild Life Forest Experiment Station,' in which there shall be maintained records of the results of the experiments and investigations made and research work accomplished; also a library of works, publications, papers and data having to do with wild life, together with means for practical illustration and demonstration, which library shall, at all reasonable hours, be open to the public." [Laws of New York, chapter 536. Became a law May 10, 1919.]

As a General Memorial

While this Memorial Station was founded by New York State, its functions are not limited solely to the State. The Trustees are further authorized to cooperate with other agencies, so that the work is by no means limited to the boundaries of the State or by State funds. Provision for this has been made by the law as follows:

"To enter into any contract necessary or appropriate for carrying out any of the purposes or objects of the College, including such as shall involve cooperation with any person, corporation or association or any department of the government of the State of New York or of the United States in laboratory, experimental, investigative or research work, and the acceptance from such person, corporation, association, or department of the State or Federal government of gifts or contributions of money, expert service, labor, materials, apparatus, appliances or other property in connection therewith." [Laws of New York, chapter 42. Became a law March 7, 1918.]

By these laws the Empire State has made provision to conduct forest wild life research upon a comprehensive basis, and on a plan as broad as that approved by Theodore Roosevelt himself.

Form of Bequest to the Roosevelt Wild Life Memorial

I hereby give and bequeath to the Roosevelt Wild Life Forest Experiment Station of The New York State College of Forestry at Syracuse, for wild life research, library, and for publication, the sum of, or the following books, lands, etc.

